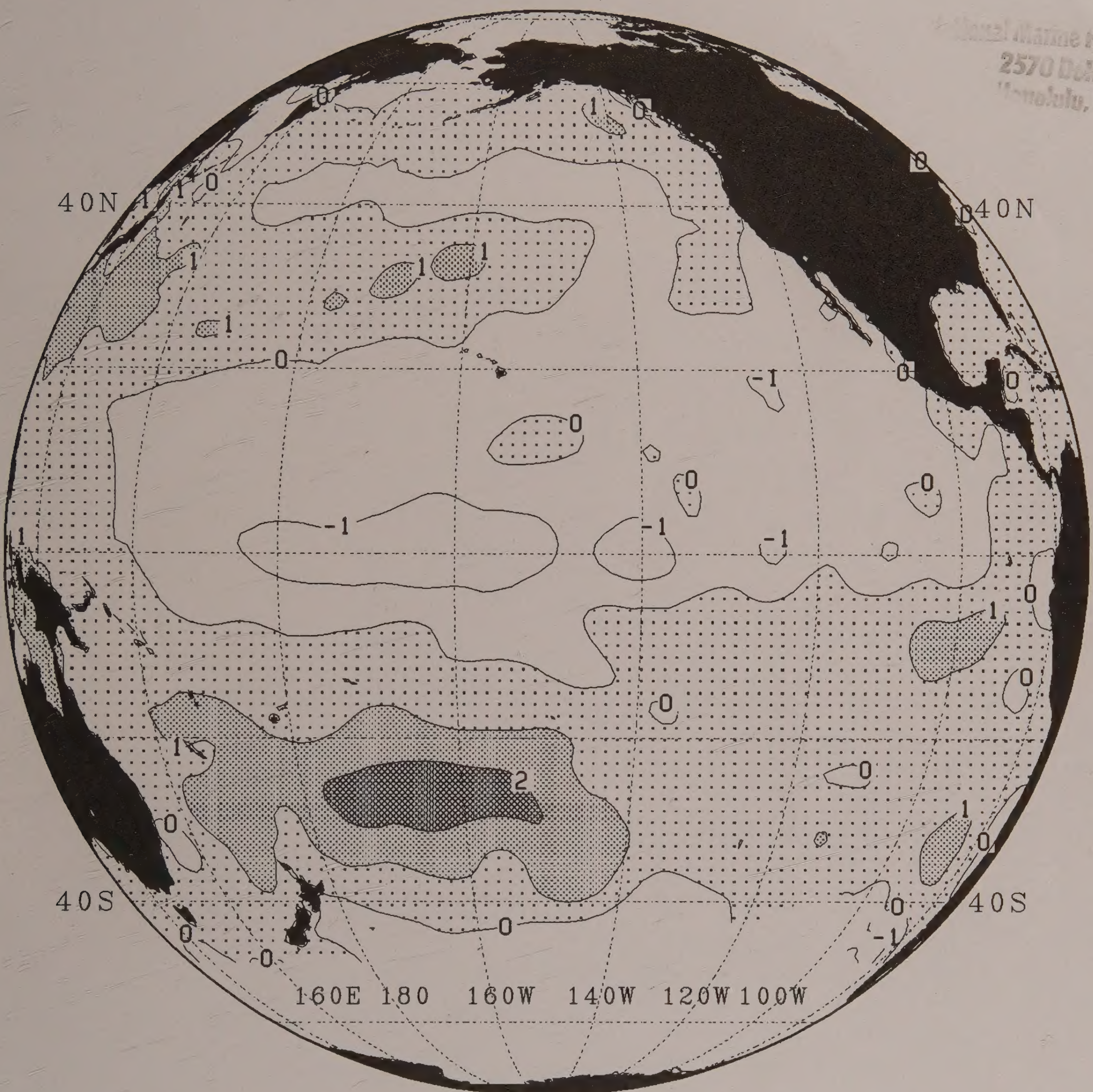
気象庁海洋月報

Monthly Ocean Report

November 1998 (No. 71)



Climate and Marine Department
Japan Meteorological Agency

気象庁 気候・海洋気象部

平成１０年１１月

気象庁海洋月報は、気象庁 気候·海洋気象部 海洋課で作成しています。
本月報に関する問い合わせは、
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Monthly Ocean Report is prepared by the Oceanographical Division, Climate and Marine Department, Japan Meteorological Agency.

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表紙は、1998年11月の太平洋の月平均海面水温偏差図です。
陰影部は、平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for November 1998 in the Pacific Ocean.
Areas of positive anomalies are shaded.

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海況の特徴（１９９８年１１月）

日本近海の海況

海面水温は，黒潮が大きく離岸した東海沖を除き，全般に平年より高く，南西諸島周辺から20゜N以北の日本の南，日本海北部，三陸沖及び北海道の北東で平年より１℃以上高かった（第4図）。

黒潮は，九州の東で離岸し，四国から紀伊半島にかけて接岸した後，東海沖で，大きく離岸し，上旬は八丈島付近から，中・下旬は八丈島の南を経て141゜E付近を北上し，房総半島沖を東に流れていた（第9図）。

親潮系の冷水の沿岸寄りの分枝は41.5゜N，143.5゜Eまで，沖合の分枝は39.7゜N，146.0゜Eまで，それぞれ達していた（第5図）。

太平洋の海況

太平洋赤道域の海面水温は，160゜Eから95゜Wにかけて平年より低く，日付変更線から110゜Wにかけては，−1℃以下の負偏差域が見られた。一方，150゜E以西では，＋0.5℃以上の正偏差が持続していた。

北太平洋では，日本の南から30゜Nに沿って150゜Wまで正偏差域が見られた。

南太平洋では，40゜S以南を除いてほぼ全域で正偏差となり，20゜Sに沿った日付変更線から150゜Wにかけての海域では，平年より2℃以上高かった（第16図）。

Highlights November 1998

Seas adjacent to Japan

Positive SST anomalies prevailed in seas adjacent to Japan, except off Tokai where the Kuroshio flowed off the coast. SSTs were more than 1°C above normal around Nansei Islands, south of Japan to 20°N, in the northern part of the Japan Sea, off Sanriku, and northeast of Hokkaido (Fig. 4).

The Kuroshio flowed off Kyushu and along the coasts from Shikoku to the Kii Peninsula, then meandered off Tokai. It turned northward near Hachijo Island in the first 10-day of the month and south of the island in the second and last 10-days, then flowed eastward off the Boso Peninsula (Fig. 9).

Coastal and off-coastal branches of the Oyashio cold water extended southward to 41.5°N, 143.5°E and 39.7°N, 146.0°E, respectively (Fig. 5).

Pacific Ocean

In the equatorial Pacific, negative SST anomalies dominated from 160°E to 95°W, and negative SST anomalies exceeding -1°C were observed from the date line to 110°W. Positive SST anomalies exceeding +0.5°C remained west of 150°E.

In the North Pacific, positive SST anomalies prevailed from the seas south of Japan to 150°W along 30°N.

In the South Pacific, positive SST anomalies prevailed except south of 40°S, and SSTs were more than 2°C above normal from the date line to 150°W along 20°S (Fig. 16).

対馬暖流域の表層における動物プランクトンの長期変動

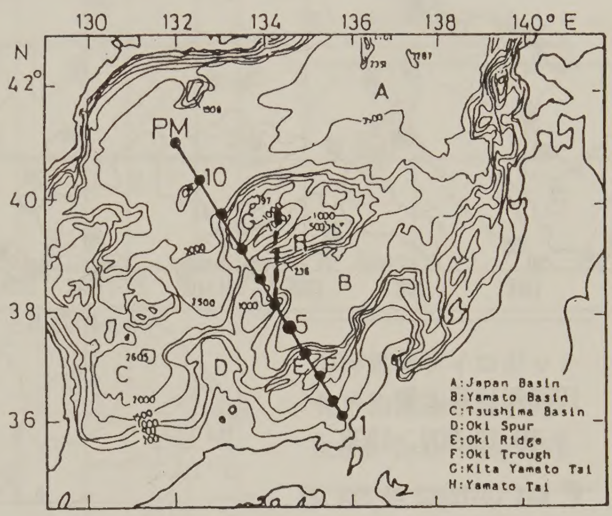
Long-term variation of zooplankton in the surface layer of Tsushima Warm Current

舞鶴海洋気象台の観測船「清風丸」は，年 4～5 回定期的に日本海の観測を行っている。1972 年から 1996 年のデータを使って，図Aの観測点 PM-2～7 における動物プランクトンの湿重量の長期変動を調べ，水温との関連を調べた。動物プランクトンの観測は，ノルパックネット（口径 45cm，網目 0.334mm）により 0～150m 深の鉛直曳きで採集し，湿重量の測定を行っている。

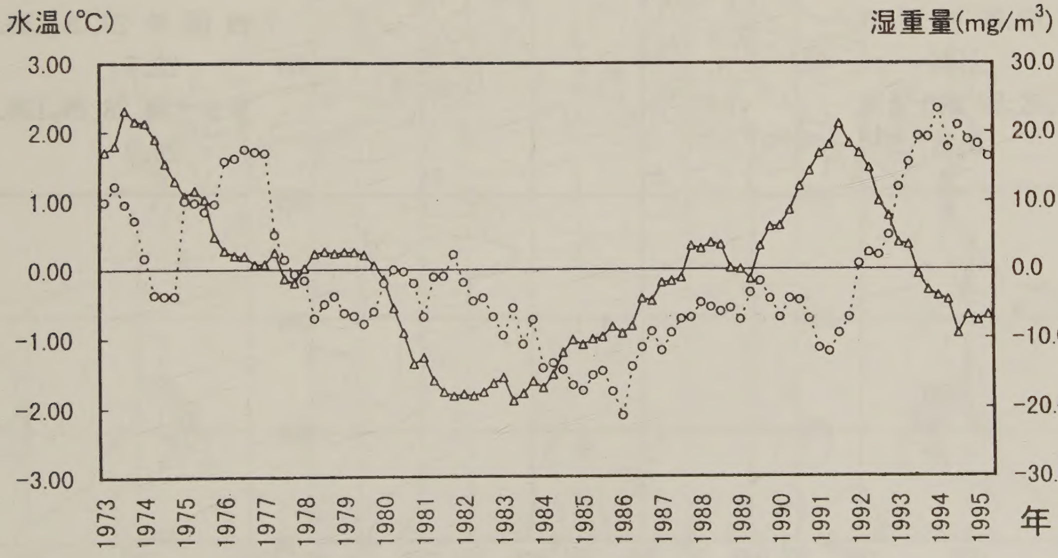
図Bに湿重量と水温の時系列を示す。最大エントロピー法により、湿重量は 20 年と 6 年，水温は 16 年と 6 年周期の変動が検出された。長周期（20 年と 16 年）変動に比べて短周期（6 年）変動の振幅は小さいが，湿重量と水温は逆位相で変動している。

The R/V Seifu Maru of Maizuru Marine Observatory/JMA has been observing oceanographical observations periodically in the Japan Sea several times a year. Long-term variation of zooplankton wet weight is analyzed by using the data from 1972 to 1996 at the stations between PM-2 and PM-7 (Fig. A), as well as the relation with averaged water temperature from the surface to a depth of 150 m. The zooplankton is observed with NORPAC Net (mouth diameter : 45 cm and the mesh size : 0.334 mm). The net is hauled vertically from 150 m depth to the surface.

Time series of wet weight and temperature are shown in Fig. B. The spectrum analyzed with the Maximum Entropy Method show peaks at 20 years and 6 years for wet weight and 16 years and 6 years for temperature, respectively. Though the amplitude of the shorter period (6 years) variation is smaller than that of the longer period (20 and 16 years), the two elements vary out of phase.

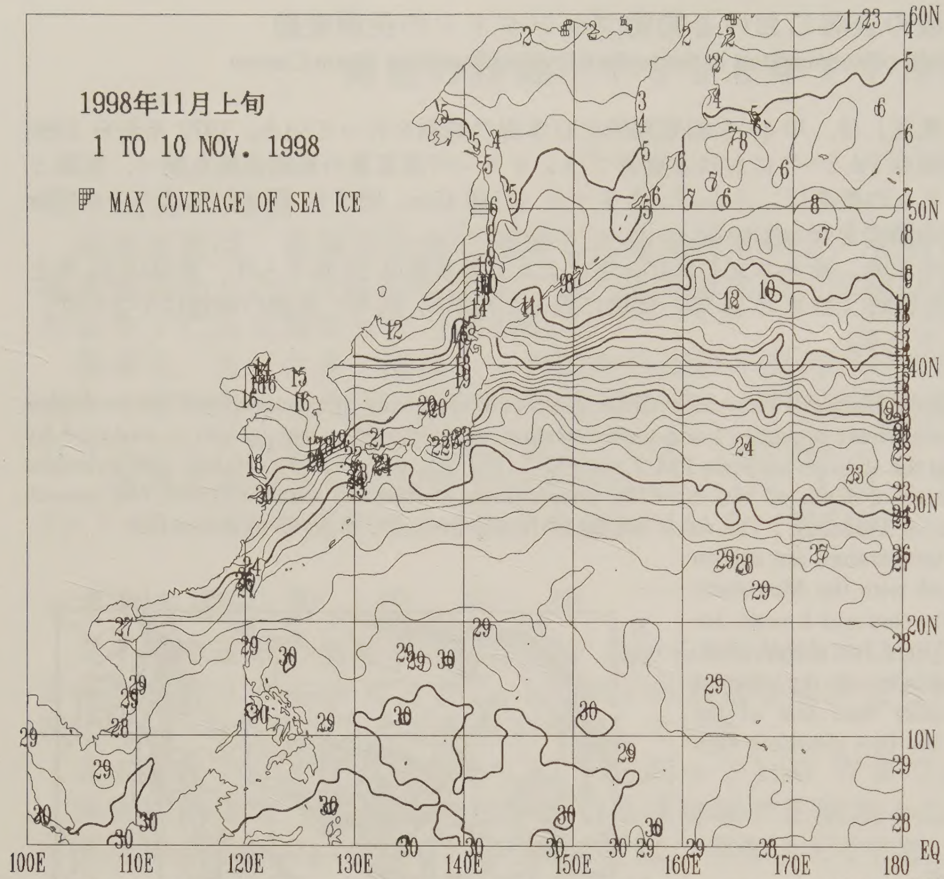


図A．観測点
Fig. A. The location of the stations

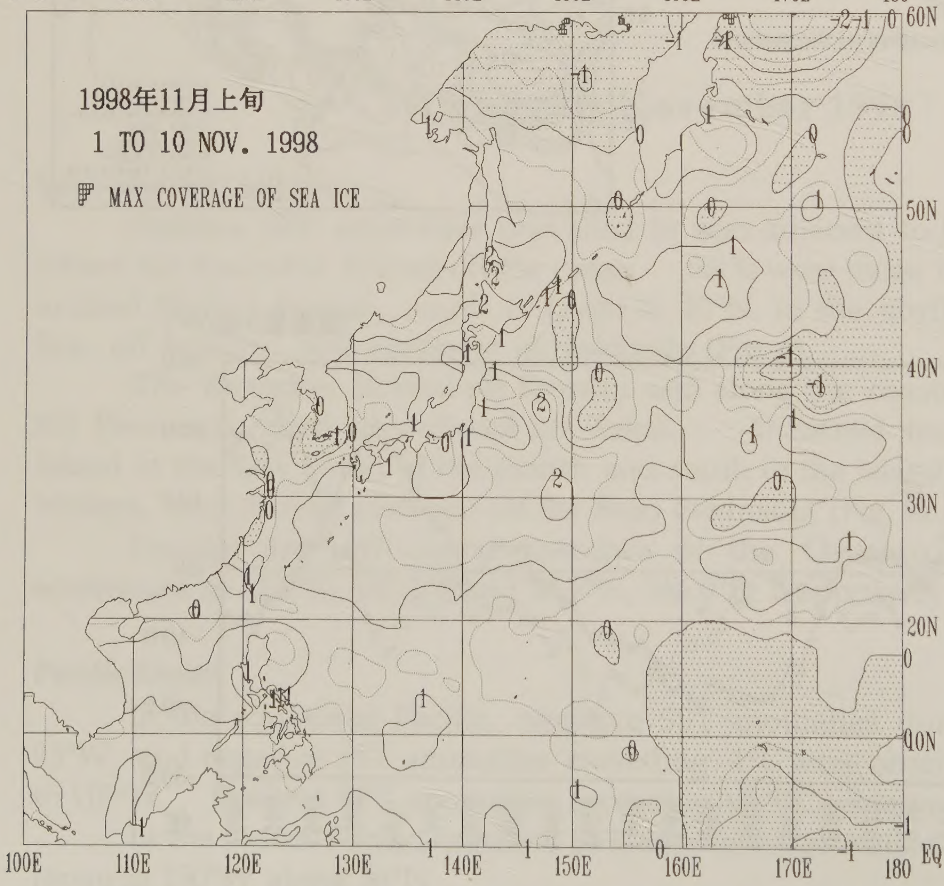


図B．湿重量偏差（△）と 0～150 m 積算平均水温偏差（○）の経年変動。
ＰＭ－２～７の平均の２年移動平均。

Fig. B. Time series of wet weight anomaly (△) and temperature anomaly (○).
The average from PM-2 to PM-7 with the 2 year running mean is shown.



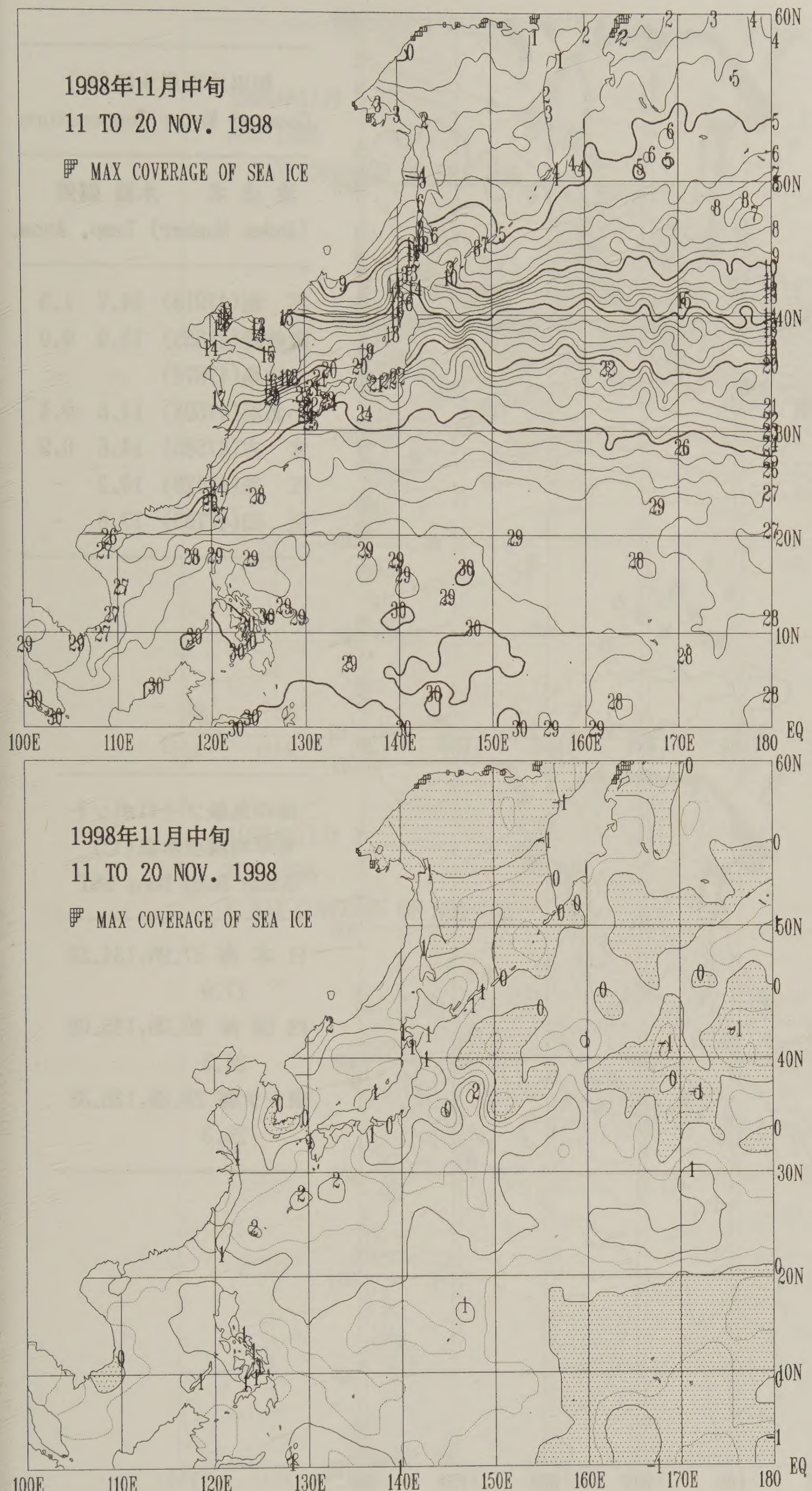
旬平均沿岸水温(℃) Coastal Water Temperature		
地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	26.6	1.6
御前崎(47655)	19.8	0.9
八丈島(47678)	-	-
小名浜(47598)	17.7	0.2
宮　古(47585)	17.0	1.2
江　差(47428)	15.1	-
浜　田(47755)	20.4	-



海洋気象ブイロボット 旬平均海面水温(℃) Ocean Data Buoy SST	
日本海	37.9N,134.5E 20.0
四国沖	29.0N,135.0E 25.7
東シナ海	28.2N,126.3E 26.0

第1図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年11月上旬)

Fig.1 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 1st ten-day period in NOV 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)
Coastal Water Temperature

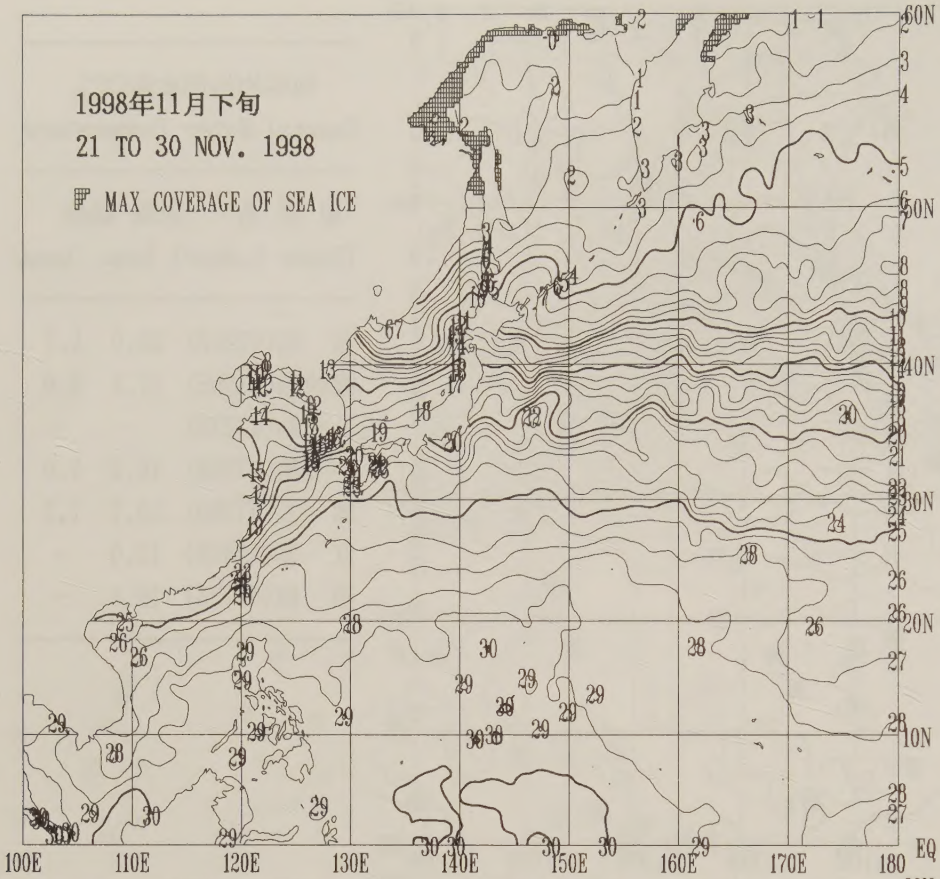
地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	26.0	1.7
御前崎(47655)	17.3	0.0
八丈島(47678)	-	-
小名浜(47598)	16.2	0.0
宮　古(47585)	16.2	1.3
江　差(47428)	12.0	-
浜　田(47755)	19.1	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,134.5E	18.5
四国沖	29.0N,135.0E	25.1
東シナ海	28.2N,126.3E	26.0

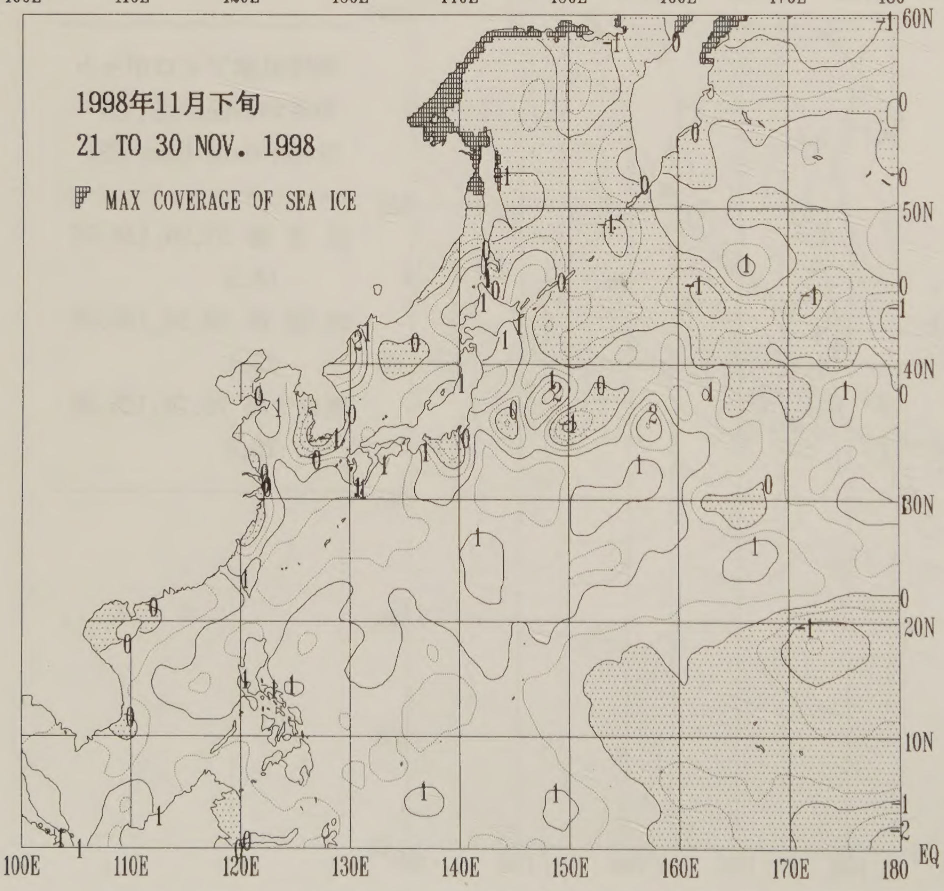
第2図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年11月中旬)

Fig.2 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 2nd ten-day period in NOV 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	24.7	1.5
御前崎(47655)	15.9	0.0
八丈島(47678)	-	-
小名浜(47598)	14.6	-0.4
宮　古(47585)	14.6	0.9
江　差(47428)	10.2	-
浜　田(47755)	17.8	-



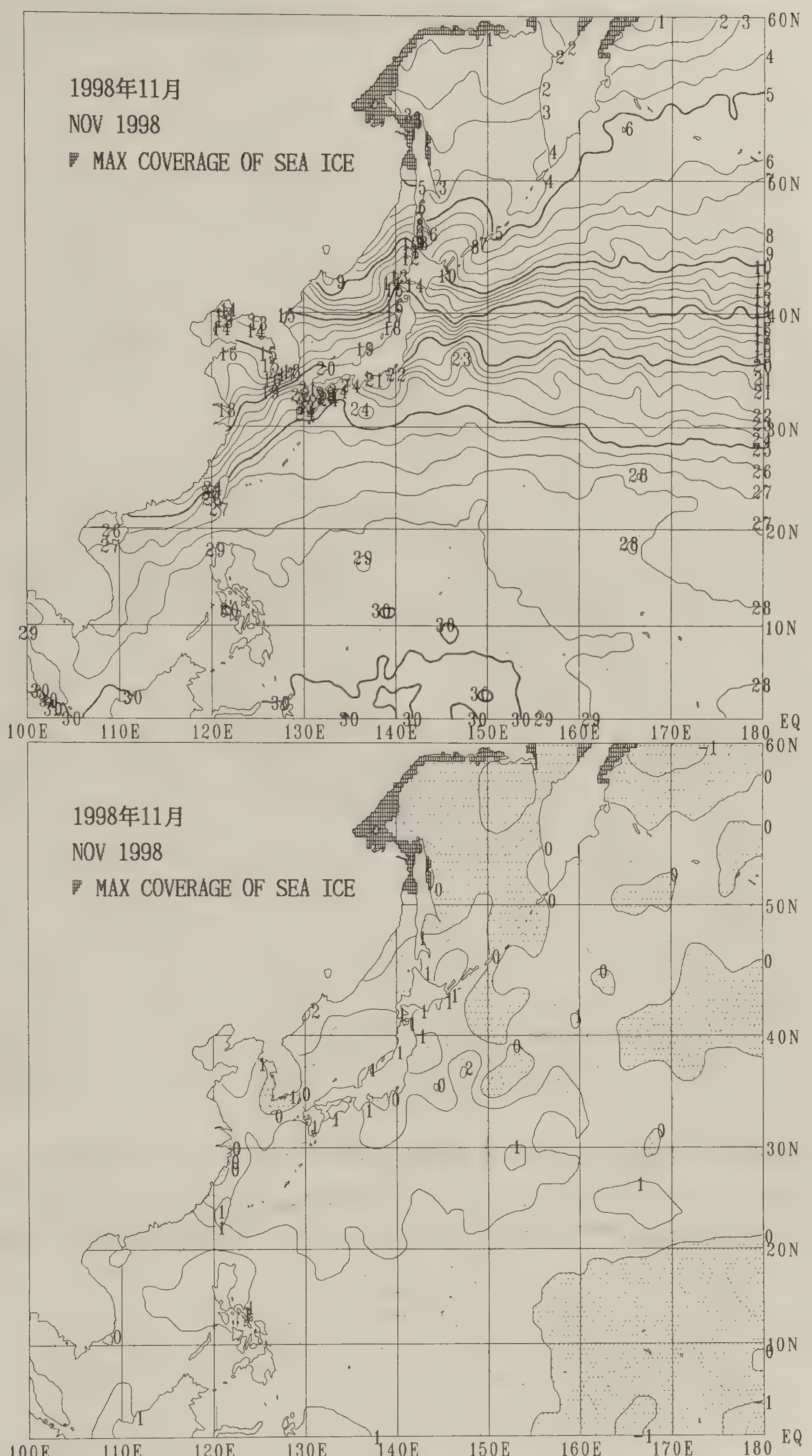
海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

地点	位置	SST
日本海	37.9N,134.5E	17.0
四国沖	29.0N,135.0E	24.3
東シナ海	28.2N,126.3E	25.3

第3図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年11月下旬)

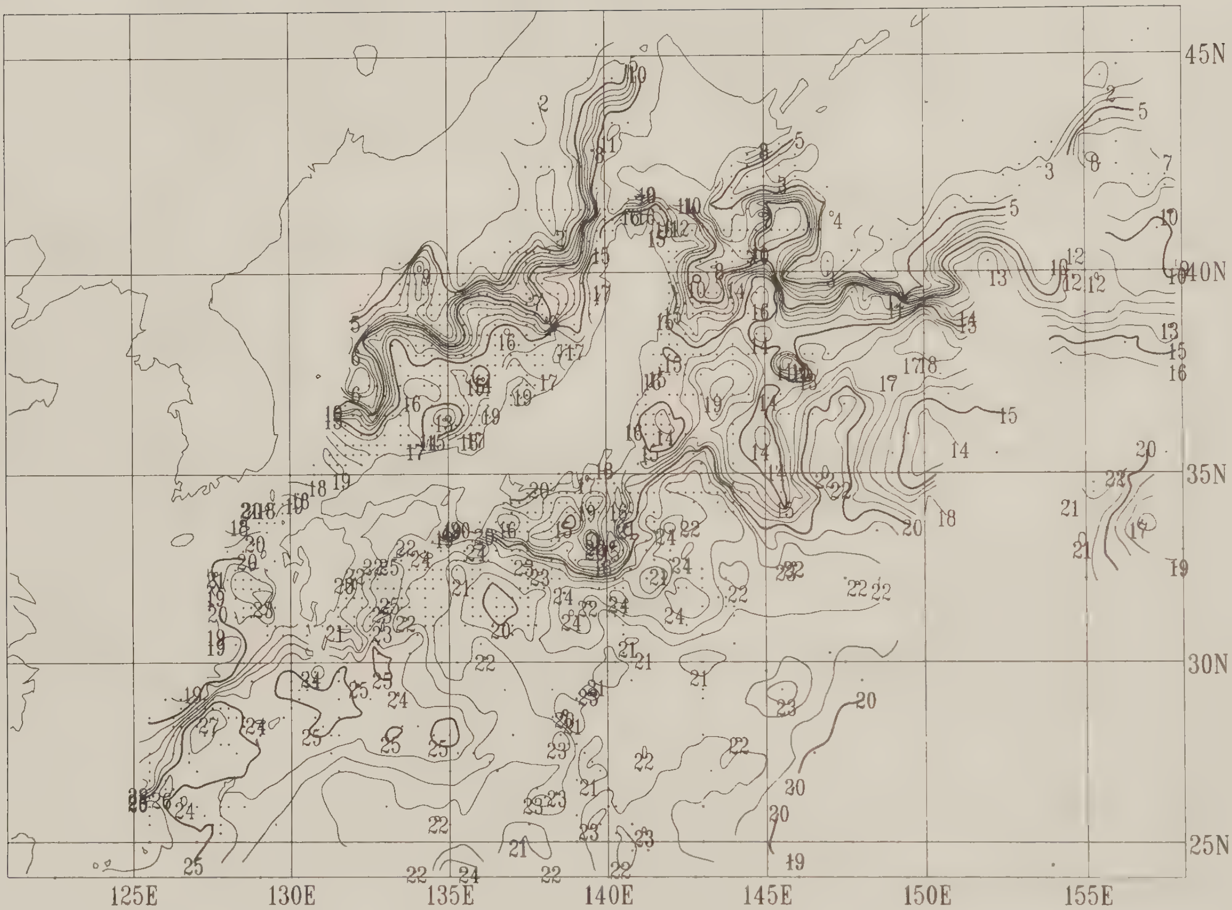
Fig.3 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 3rd ten-day period in NOV 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

Monthly Mean SST & Anomalies



第4図 北西太平洋月平均海面水温図(上)及び偏差図(下)(1998年11月)

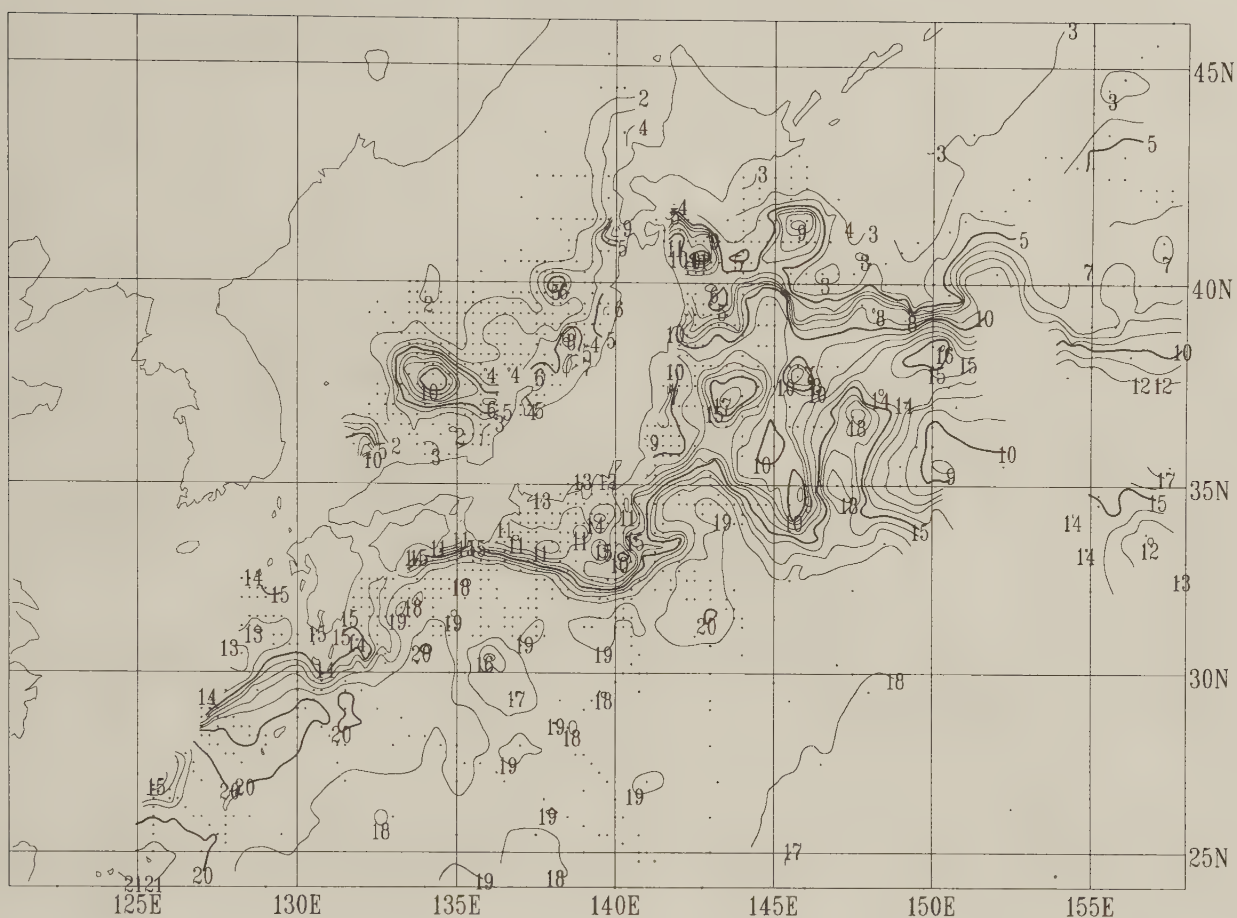
Fig.4 Monthly mean SST (top) and anomalies (bottom) in the western North Pacific for NOV 1998. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



第5図　日本近海表層水温図(深さ100m)(1998年11月)

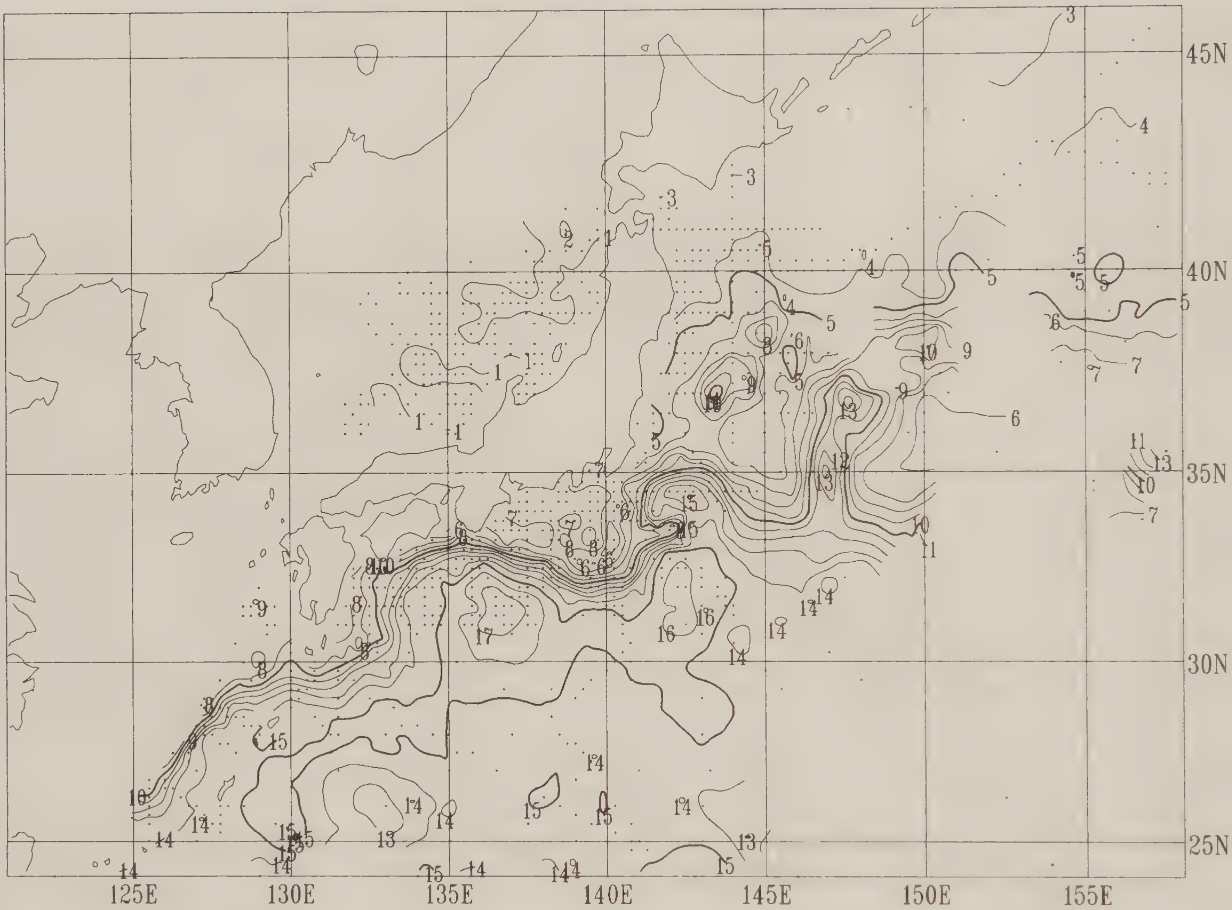
Fig.5 Subsurface (100m) temperatures in the seas adjacent to Japan for NOV 1998. Contour interval is 1°C. Observation points are denoted by dots.

200m Temperatures in the Seas Adjacent to Japan



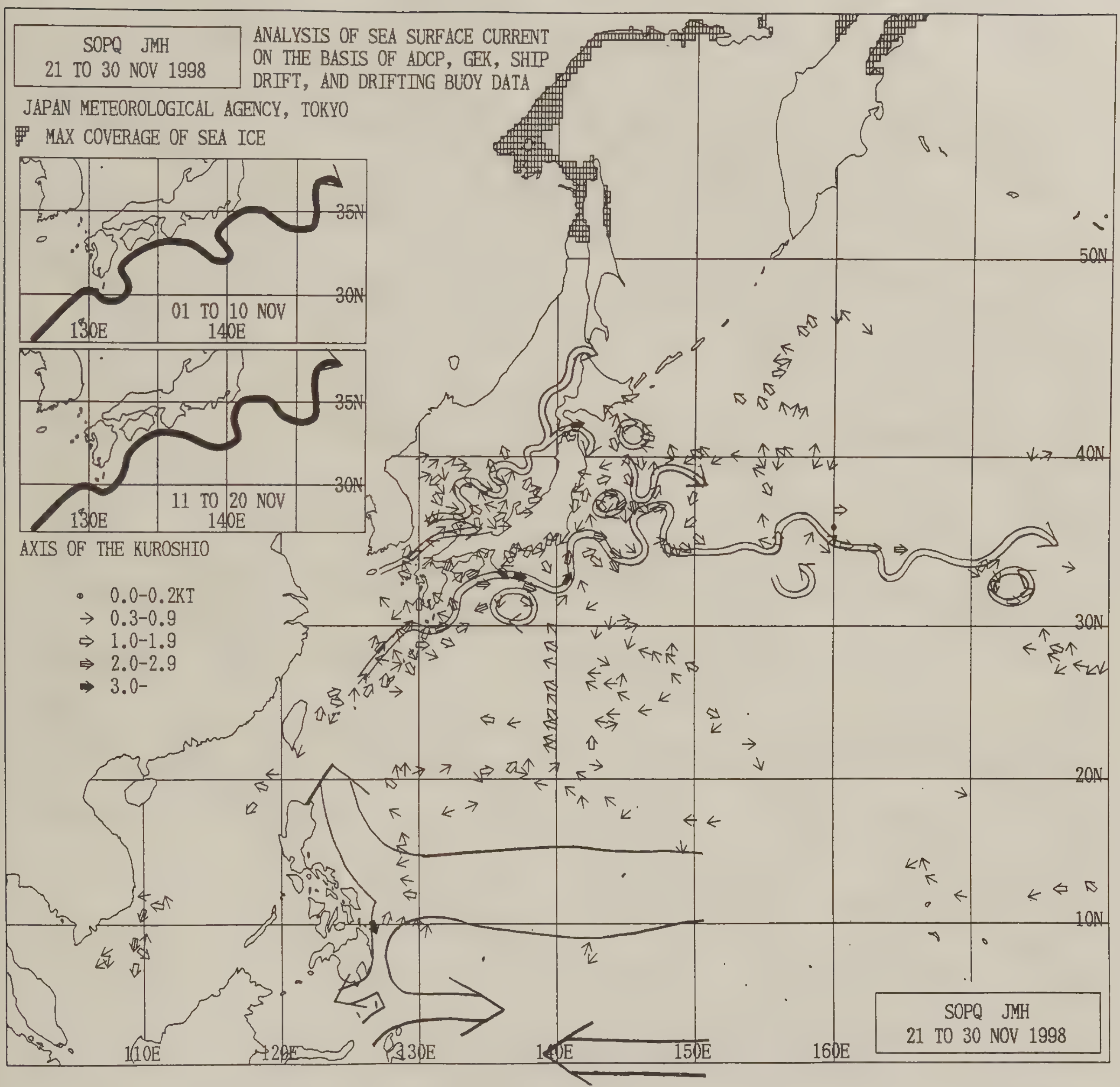
第6図　日本近海表層水温図(深さ200m)(1998年11月)

Fig.6 Subsurface (200m) temperatures in the seas adjacent to Japan for NOV 1998. Contour interval is 1°C. Observation points are denoted by dots.



第7図　日本近海表層水温図(深さ400m) (1998年11月)

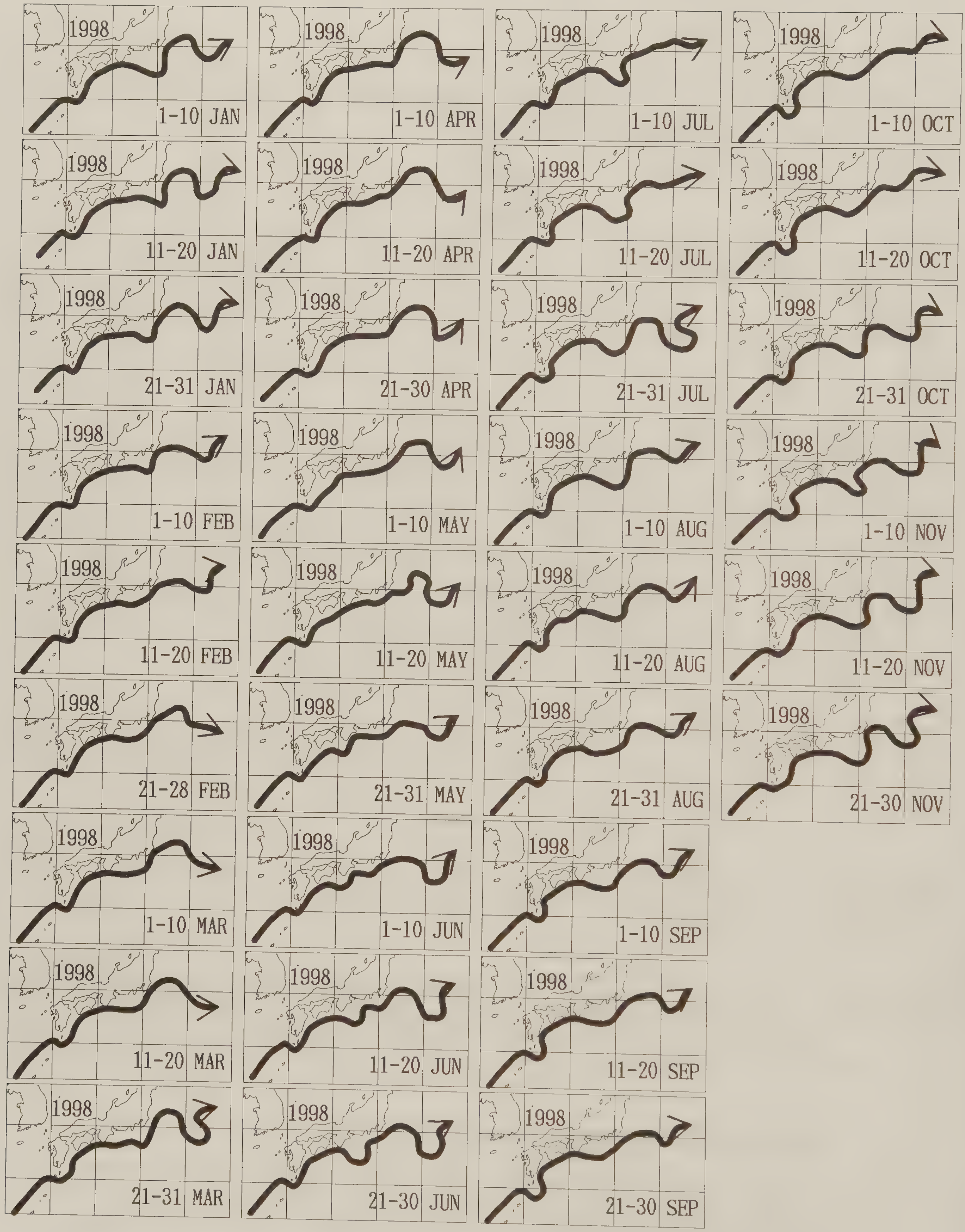
Fig.7 Subsurface (400m) temperatures in the seas adjacent to Japan for NOV 1998. Contour interval is 1°C. Observation points are denoted by dots.



第8図　北西太平洋海流図（1998年11月下旬）

Fig.8 Analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in NOV 1998. Small arrows indicate in situ observations. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.

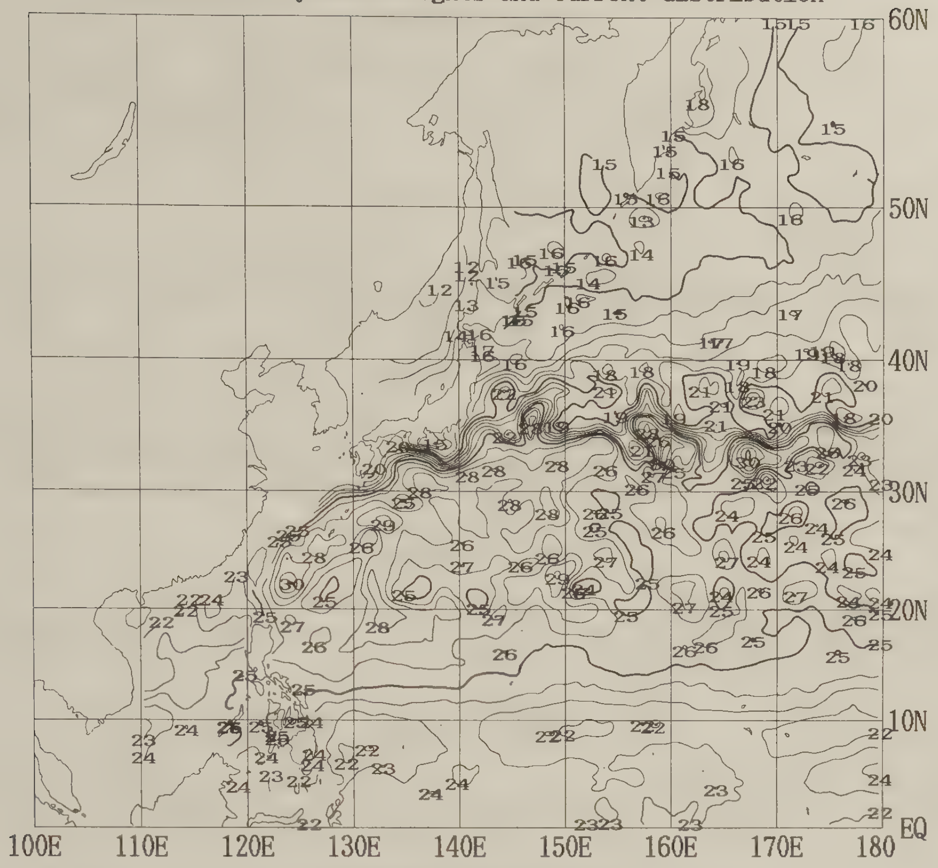
Location of the Kuroshio axis



第9図 旬別黒潮流軸図

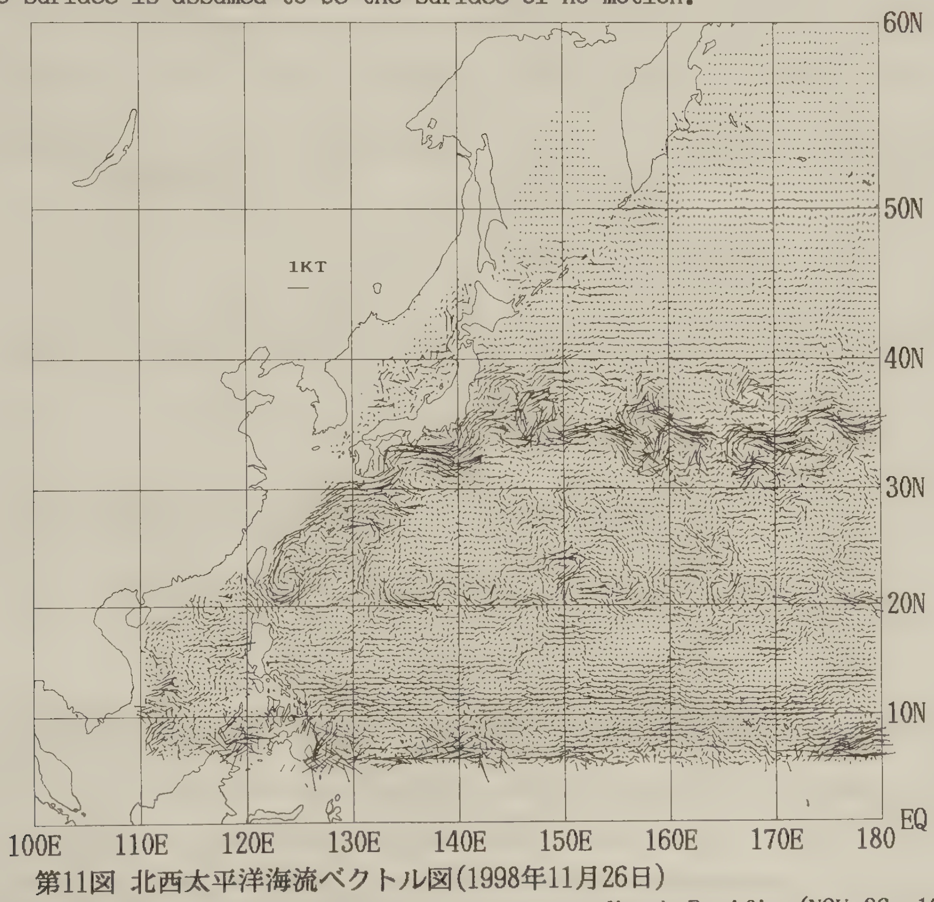
Fig.9 Location of the Kuroshio axis

Sea surface dynamic heights and current distribution



第10図 北西太平洋力学的海面高度分布図(1998年11月26日)

Fig.10 Sea surface dynamic heights (10cm) in the western North Pacific derived from the altimeter data of TOPEX/POSEIDON (NOV 26, 1998).
1500db surface is assumed to be the surface of no motion.



第11図 北西太平洋海流ベクトル図(1998年11月26日)

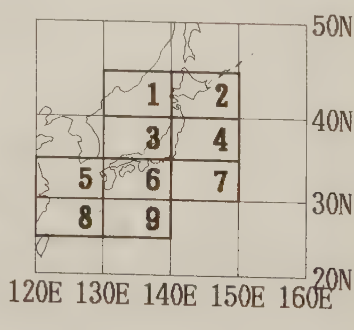
Fig.11 Sea surface current vectors in the western North Pacific (NOV 26, 1998).
Vectors are derived from the sea surface dynamic heights from TOPEX/POSEIDON and subsurface temperature distribution assuming the geostrophic relation.

Time Series of Area Mean SST in the Western North Pacific

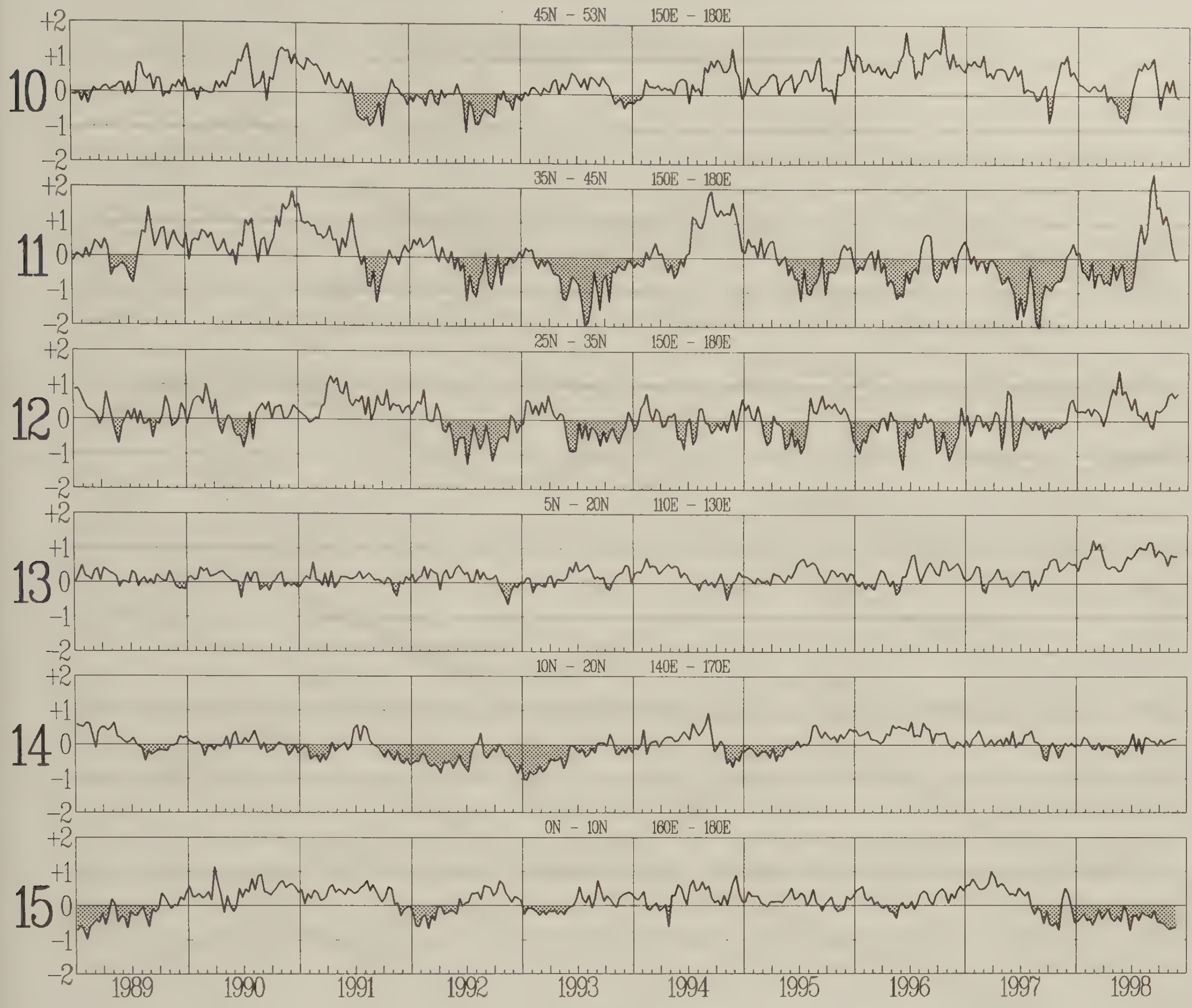


第12図　海域別旬平均海面水温平年偏差時系列図

Fig.12 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

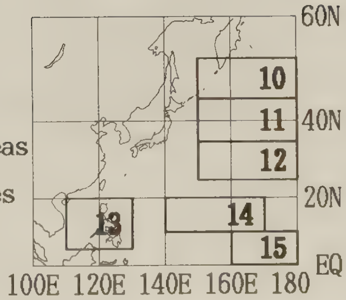


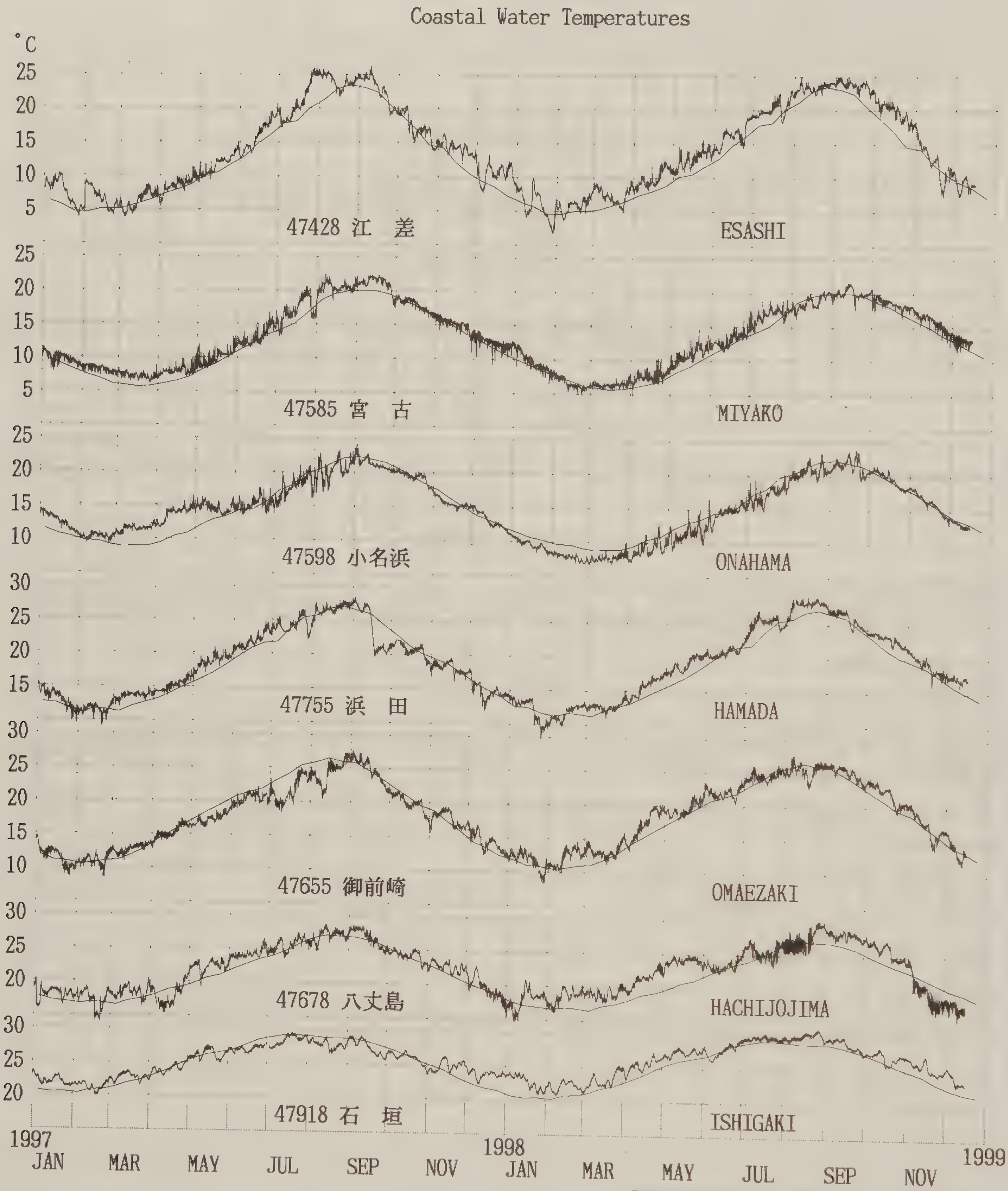
Time Series of Area Mean SST in the Western North Pacific



第12図　海域別旬平均海面水温平年偏差時系列図（つづき）

Fig.12 (continue) Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).



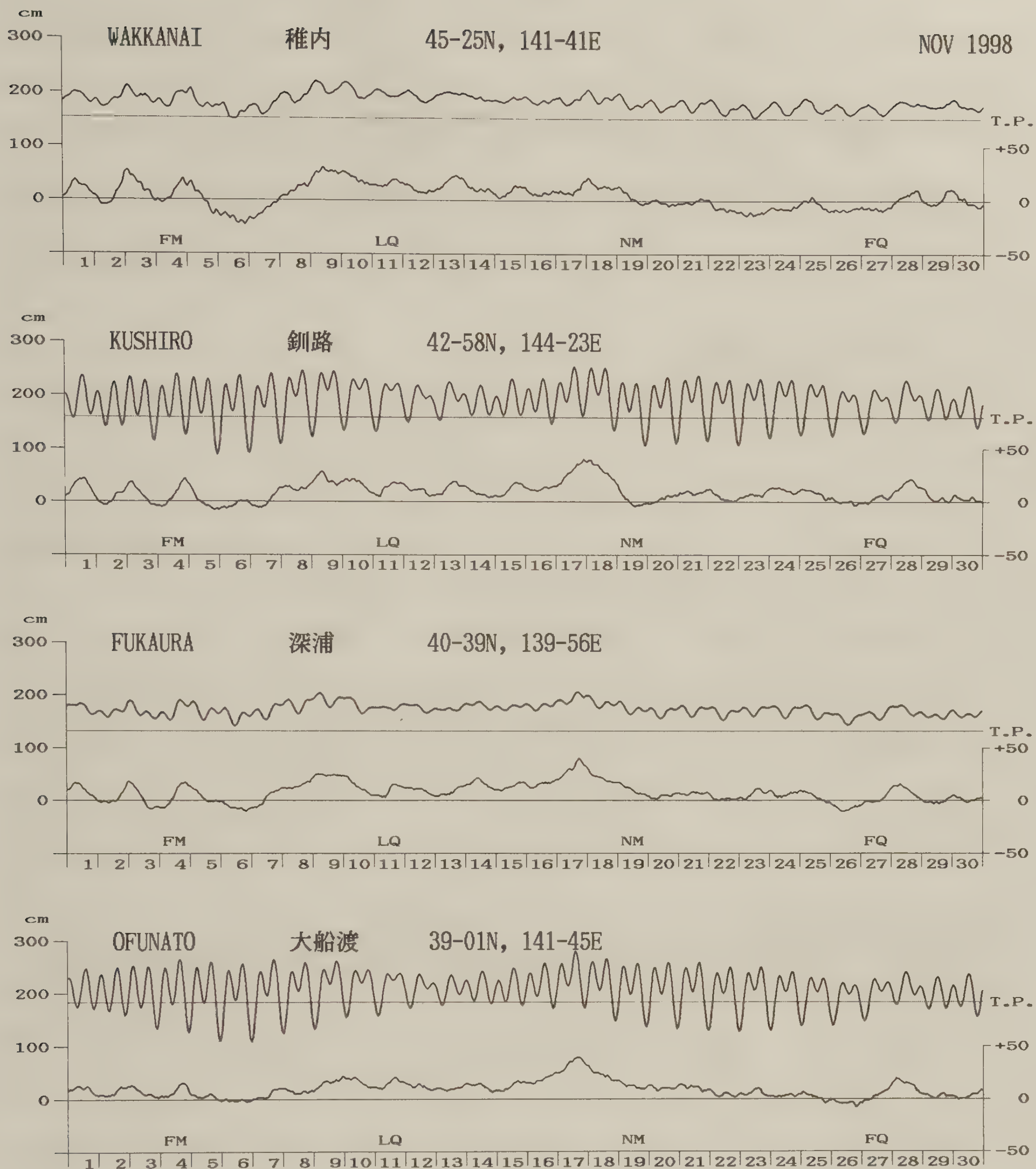




第13図 沿岸水温時系列図

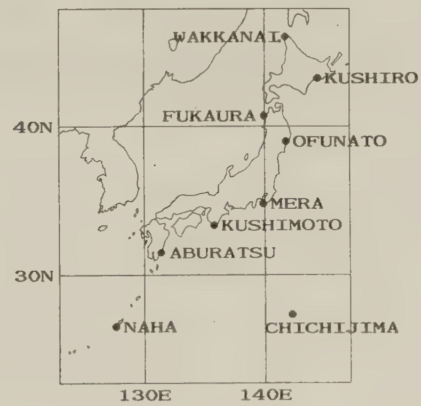
Fig.13 Time series of hourly coastal water temperatures (˚C) measured at 7 coastal stations of the JMA shown in the right panel.
Thin lines show ten-day mean climatology.

Time Series of Sea Level

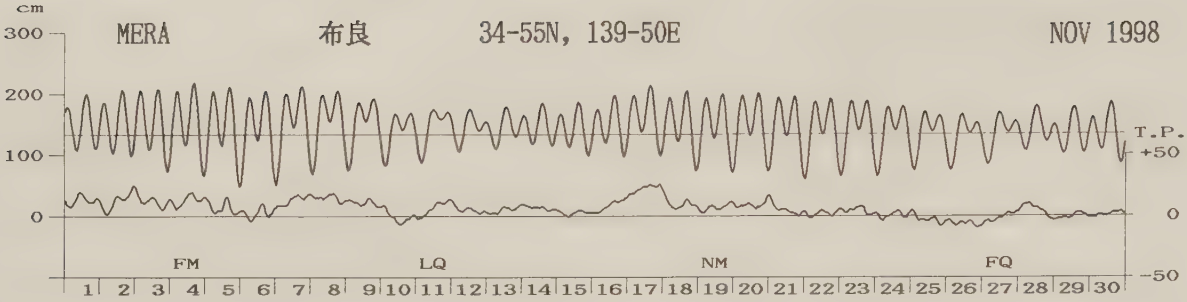


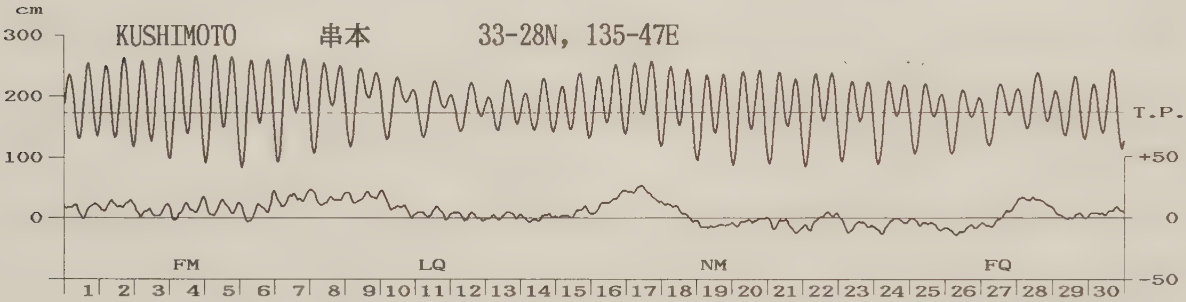
第14図 沿岸潮位時系列図（1998年11月）

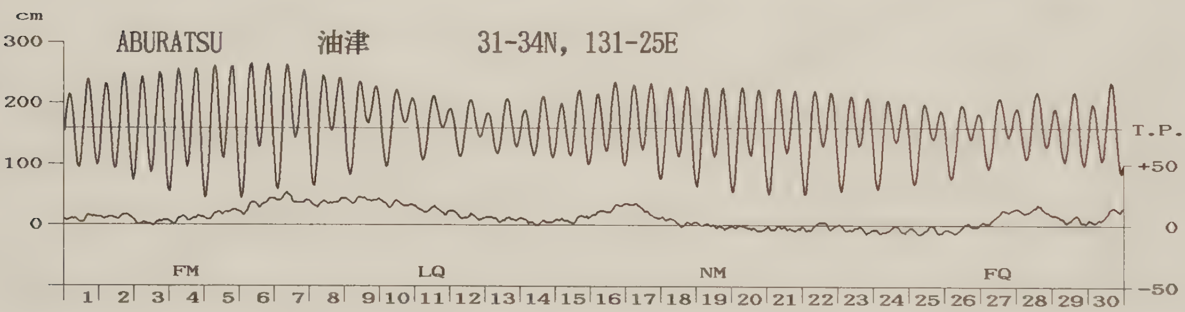
Fig.14 Time series of hourly sea level observation (upper line) and its anomalies (lower line) at 9 stations of the JMA in the right panel.
Short term variations are removed from raw data.

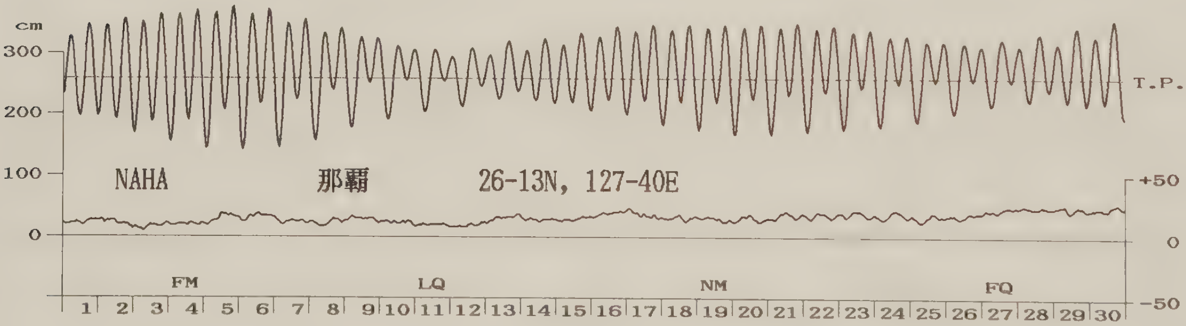


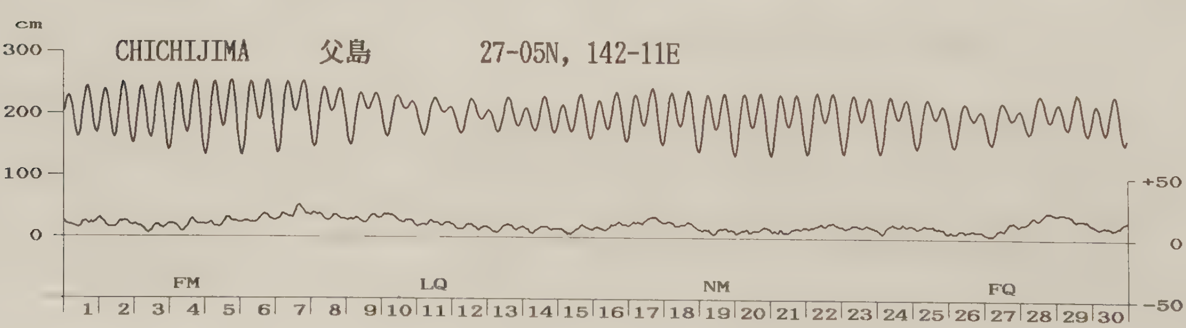
FM: full moon, FQ: first quarter
NM: new moon, LQ: last quarter
T.P.: Mean sea level of Tokyo Bay (Tokyo Peil)





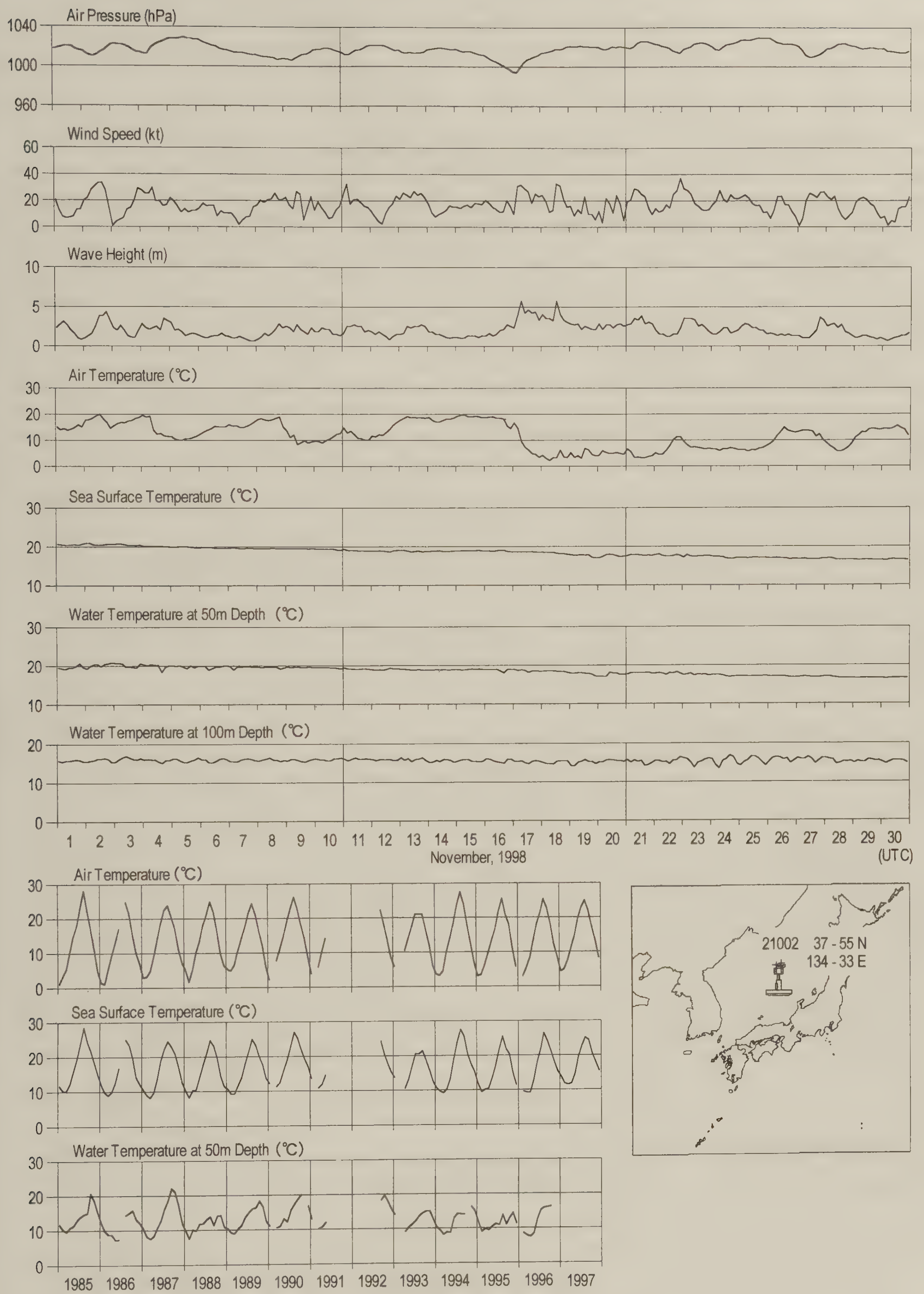






第14図 つづき
Fig.14 continue

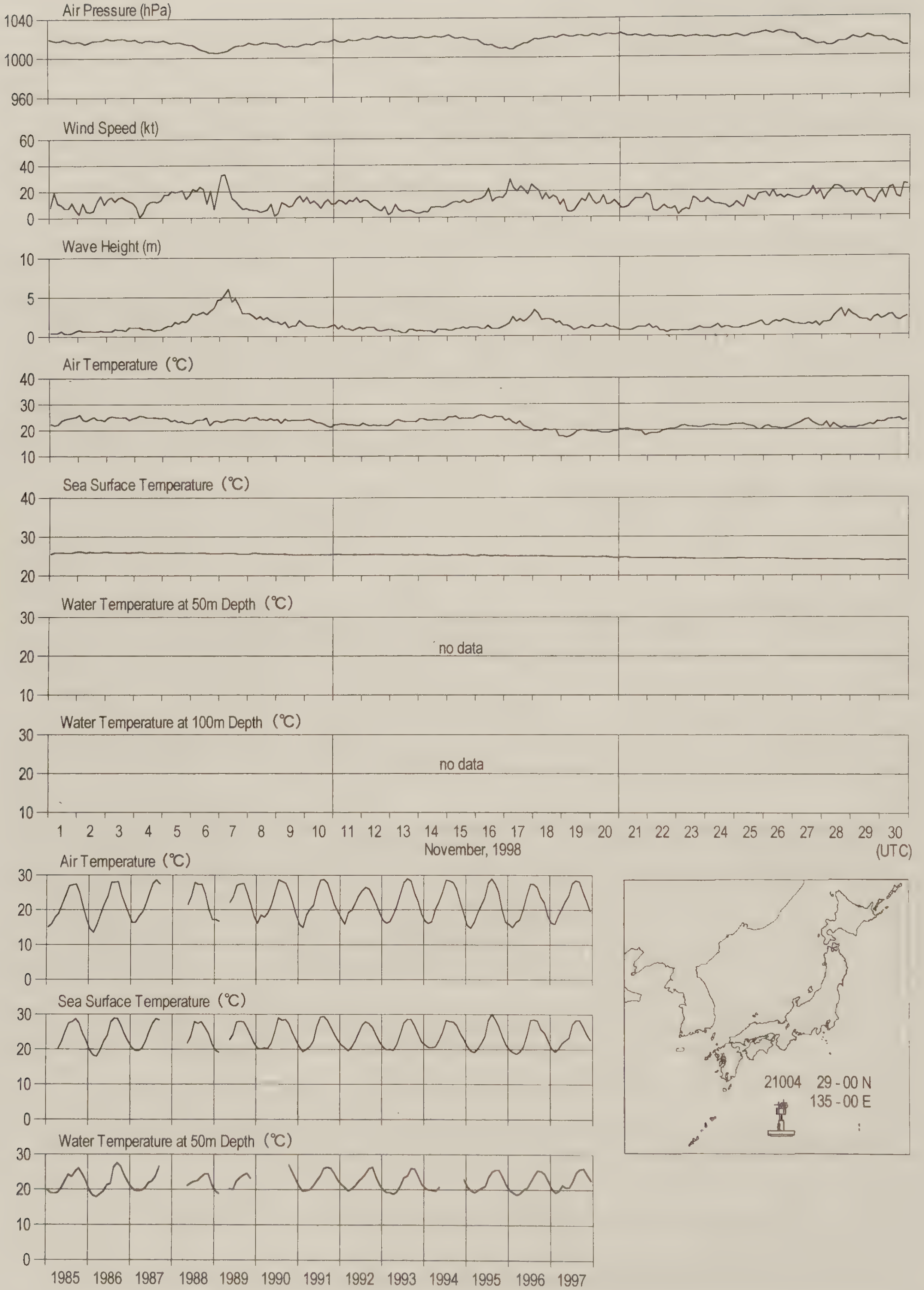
Ocean Data Buoy Observations



第15図　海洋気象ブイロボットによる観測要素の時系列図（日本海：21002）
上段は３時間毎の観測値を、下段は月平均値を示す。

Fig. 15　Time series of JMA buoy observation in the Japan Sea (WMO ID No. 21002). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

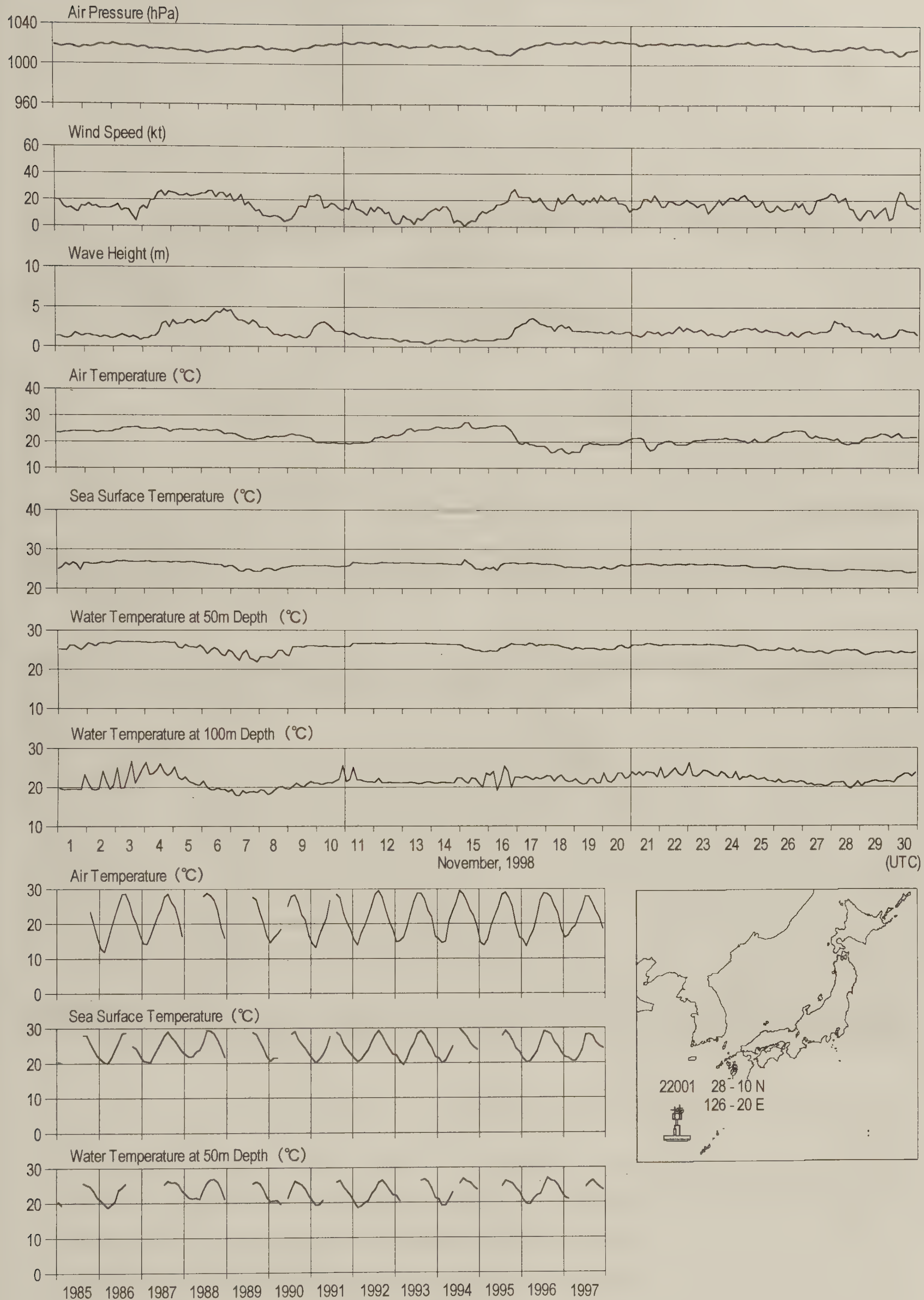
Ocean Data Buoy Observations



第15図　海洋気象ブイロボットによる観測要素の時系列図（四国沖：21004）
上段は３時間毎の観測値を、下段は月平均値を示す。

Fig. 15　Time series of JMA buoy observation south of Shikoku (WMO ID No. 21004). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

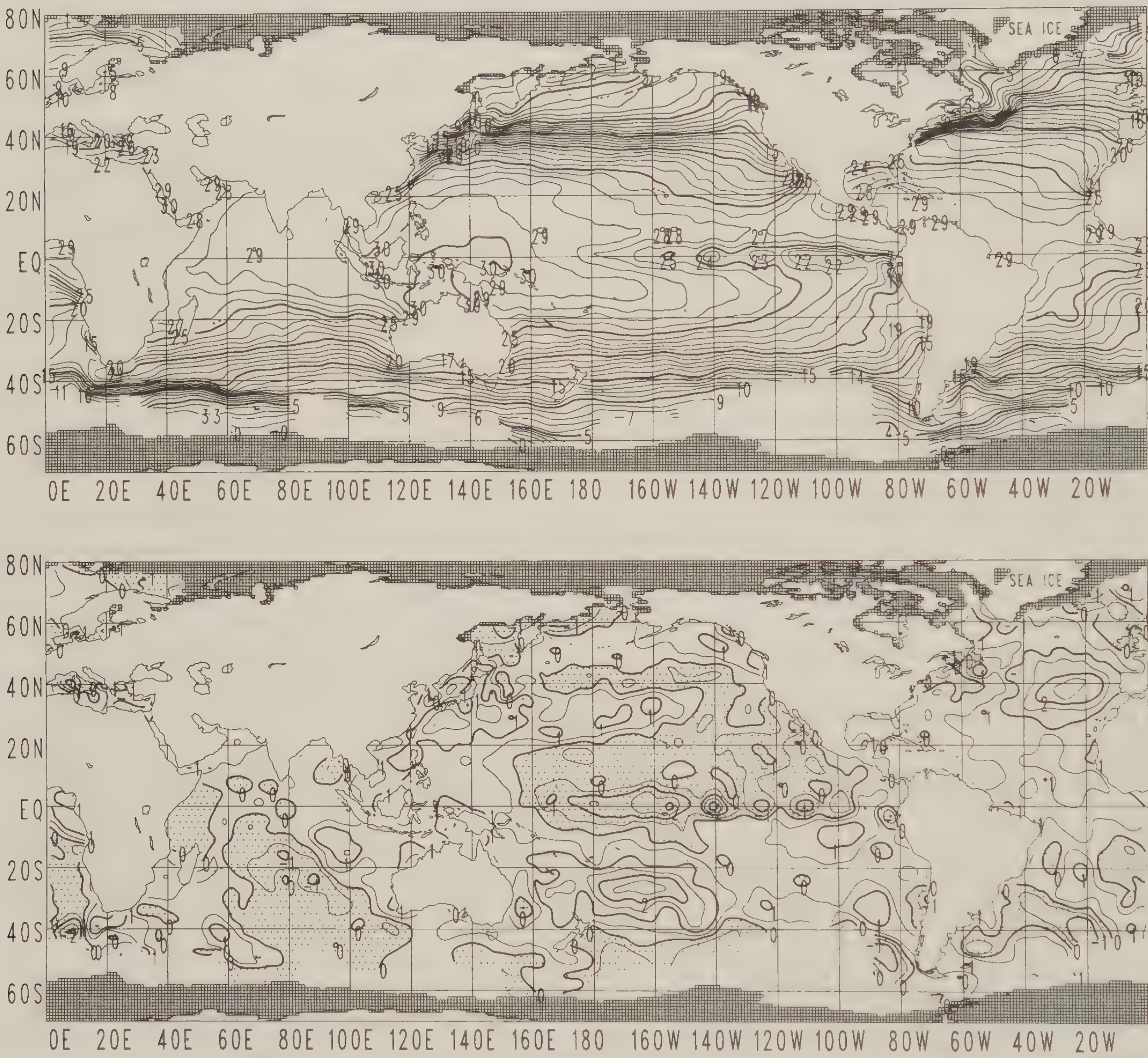
Ocean Data Buoy Observations



第15図　海洋気象ブイロボットによる観測要素の時系列図（東シナ海：22001）
上段は３時間毎の観測値を、下段は月平均値を示す。

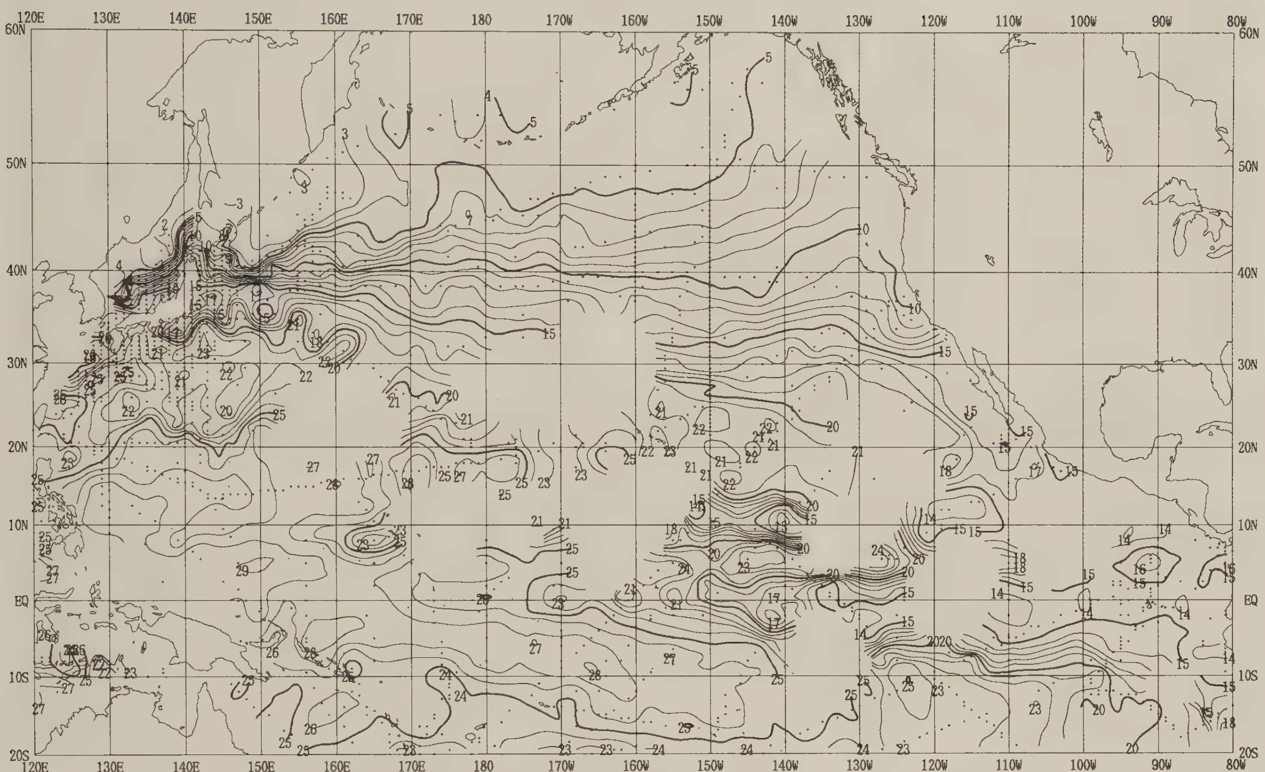
Fig. 15　Time series of JMA buoy observation in the East China Sea (WMO ID No. 22001). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

SST & Anomalies in the Global Ocean



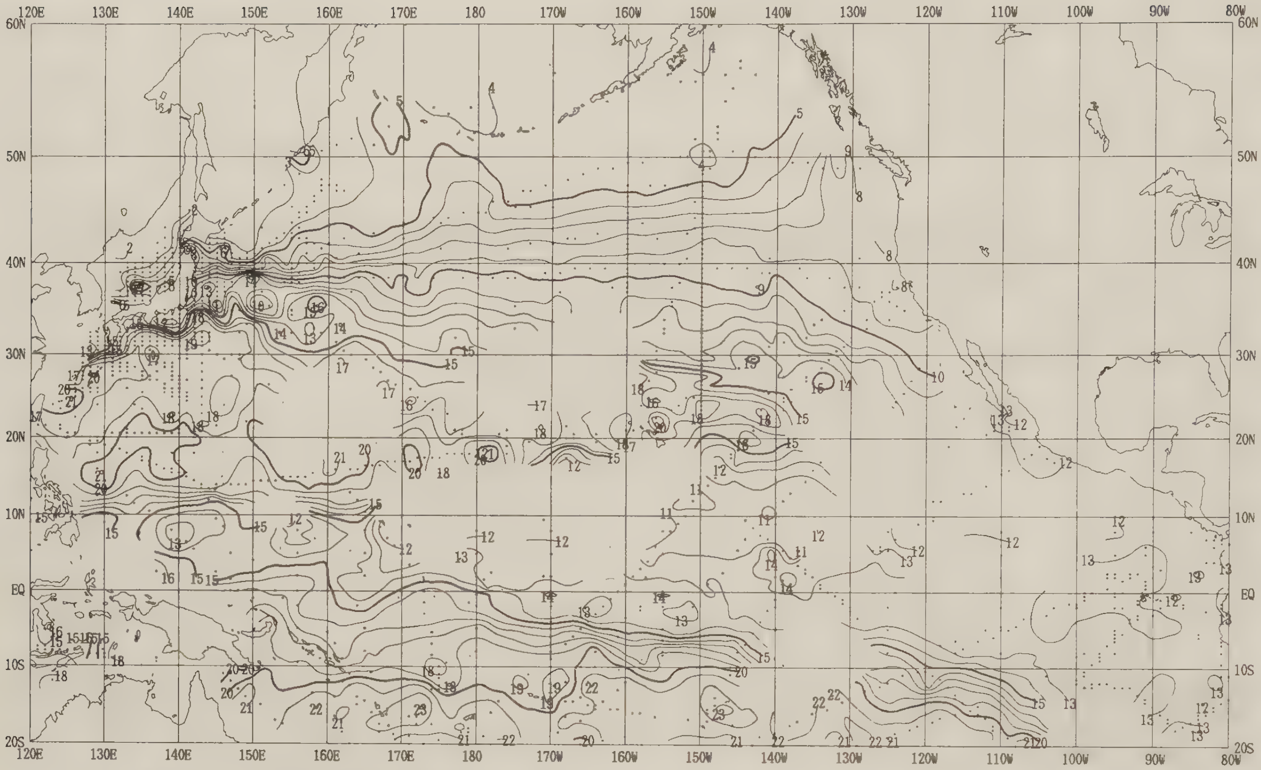
第16図　全球月平均海面水温図（上）及び偏差図（下）（1998年11月）

Fig.16 Monthly mean sea surface temperature over the global ocean (top) and anomalies (bottom) for NOV 1998. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C (top) and additional anomaly contours of ±0.5°C are shown by thin lines. Negative anomalies are spotted. Maximum coverage of sea ice is shaded. Data sources for sea ice are U.S. National Ice Center (polar regions) and JMA (the Sea of Okhotsk).



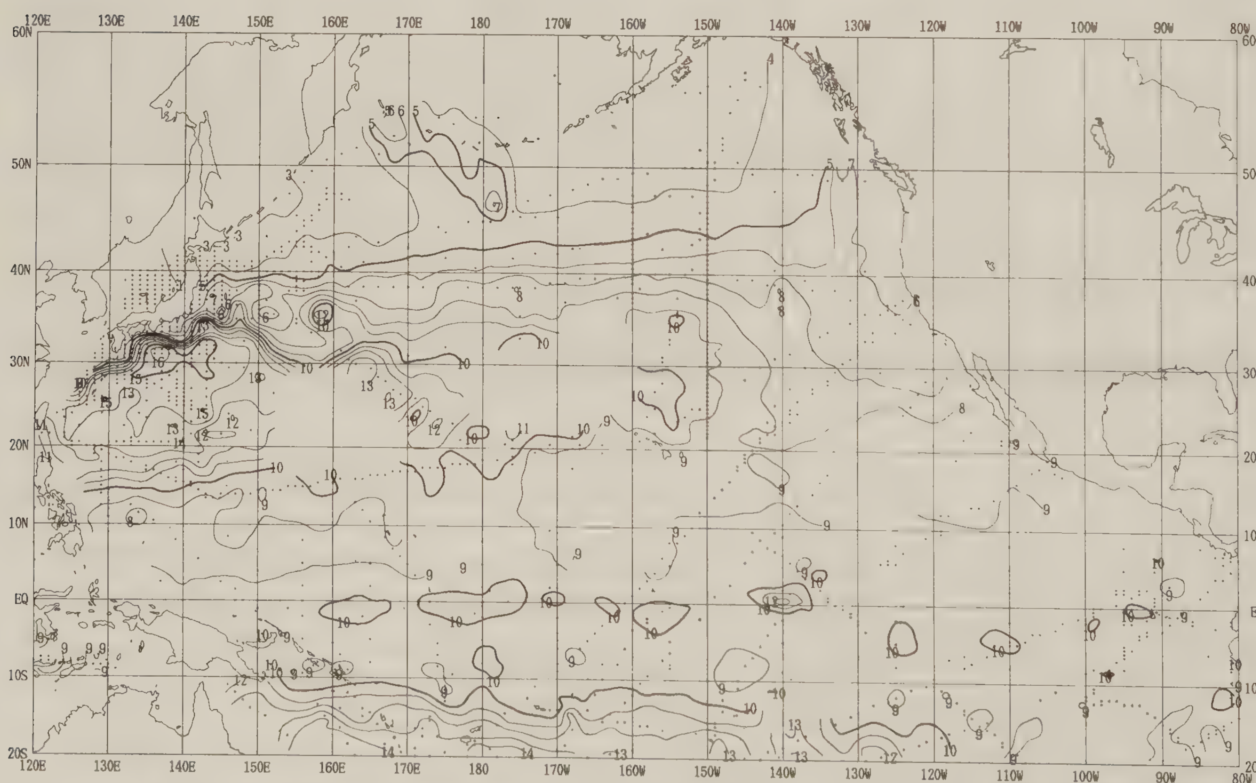
第17図　太平洋表層水温図(深さ100m) (1998年11月)

Fig.17 Subsurface (100m) temperatures in the Pacific Ocean for NOV 1998. Contour interval is 1°C. Observation points are denoted by dots.



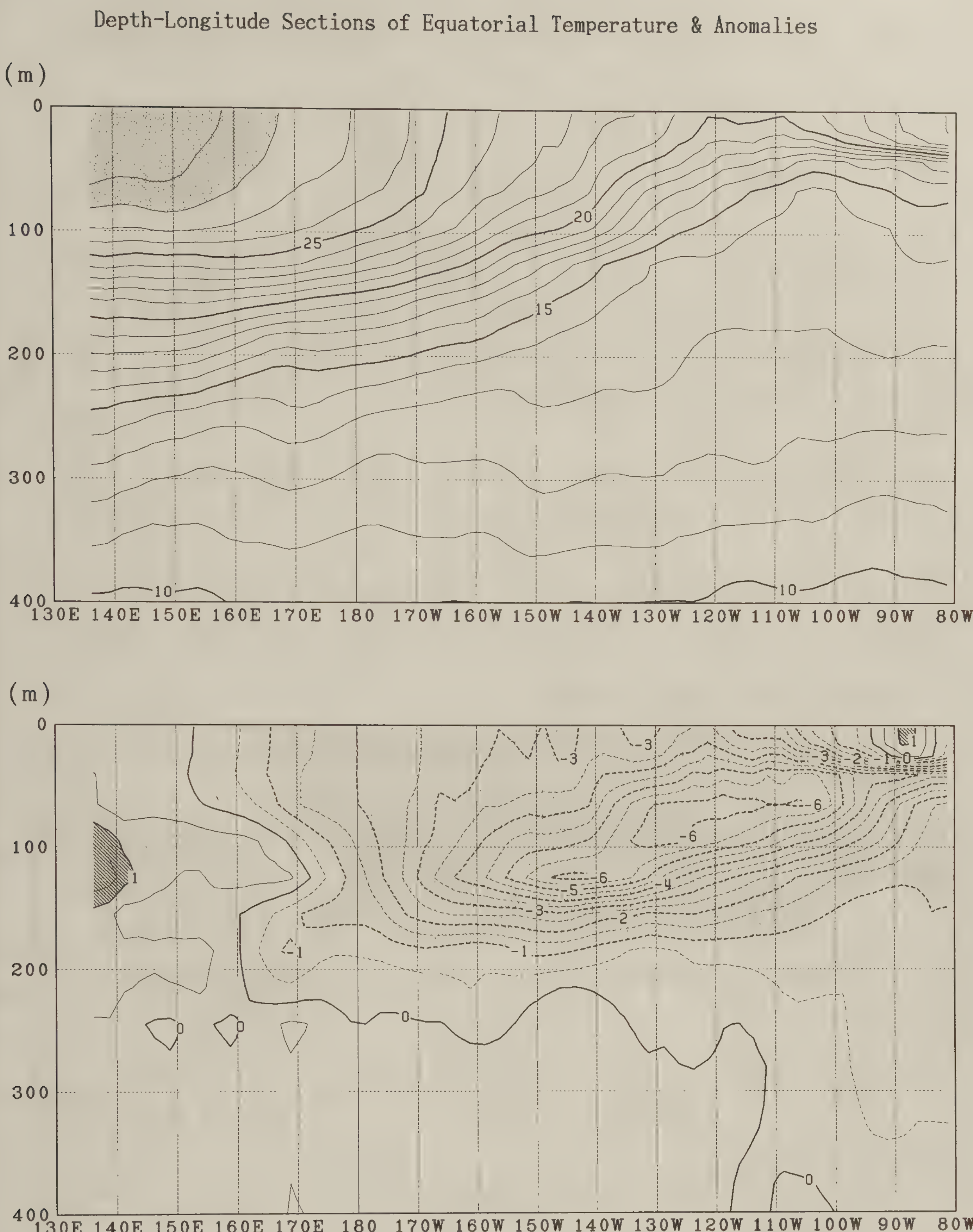
第18図　太平洋表層水温図(深さ200m) (1998年11月)

Fig.18 Subsurface (200m) temperatures in the Pacific Ocean for NOV 1998. Contour interval is 1°C. Observation points are denoted by dots.



第19図　太平洋表層水温図(深さ400m) (1998年11月)

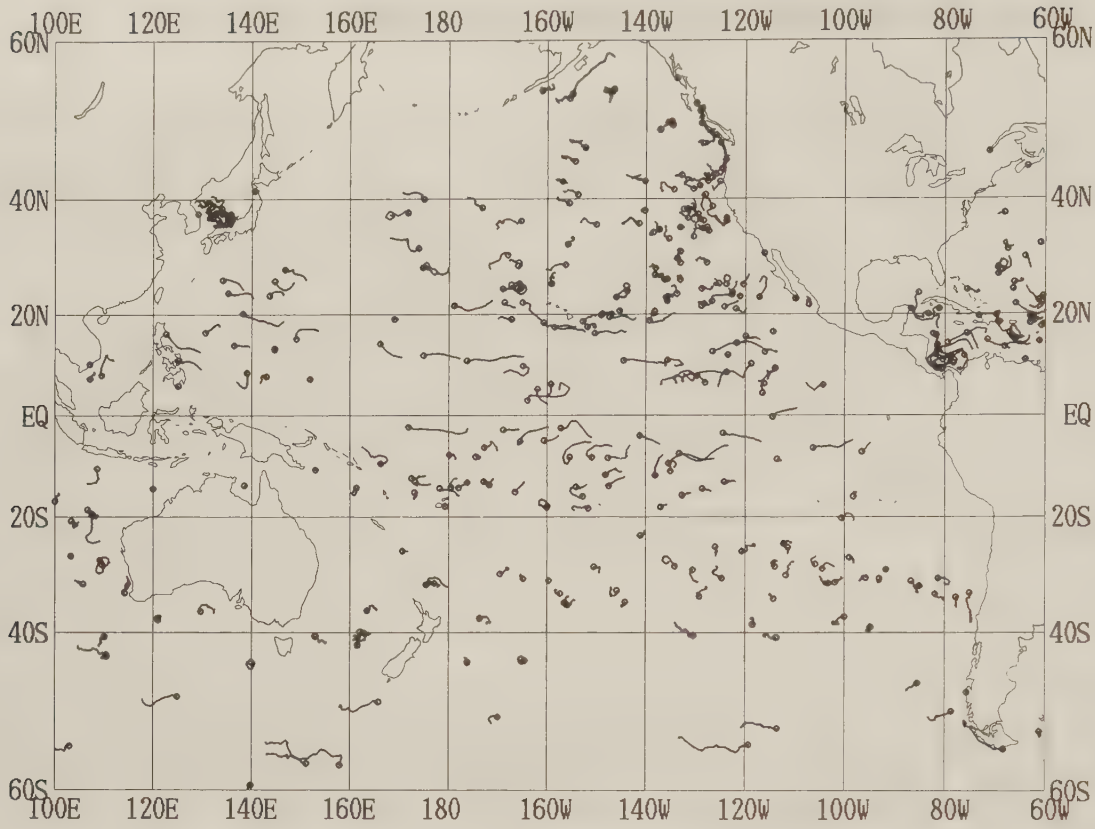
Fig.19 Subsurface (400m) temperatures in the Pacific Ocean for NOV 1998. Contour interval is 1°C. Observation points are denoted by dots.



第20図　太平洋赤道に沿う表層水温（上）及び偏差（下）の深度－経度断面図（1998年11月）

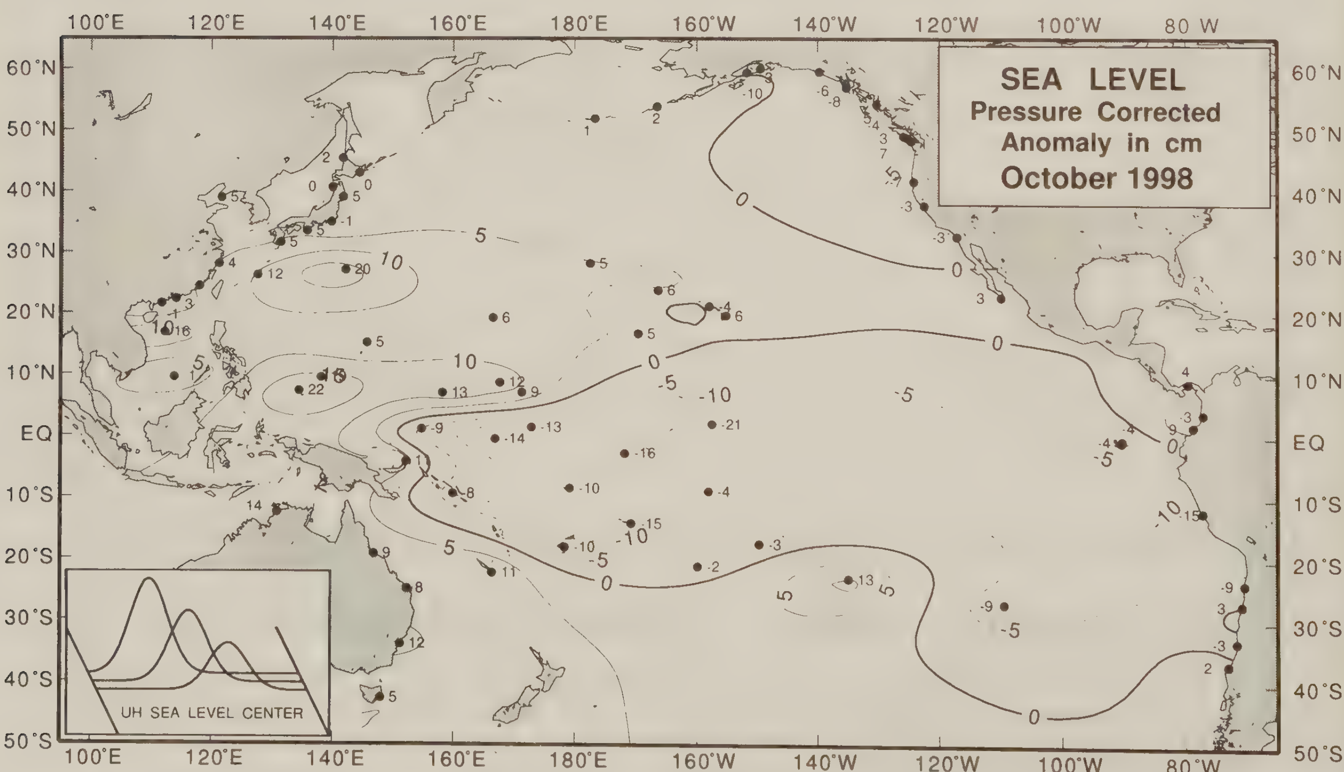
Fig.20 Depth-longitude sections of temperature (top) and anomalies (bottom) along the equator in the Pacific Ocean for NOV 1998. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (top) and 0.5°C (bottom). Values greater than 28°C in the top panel are shaded. In the bottom panel, values greater than 1°C are shaded and values less than -1°C are spotted. Anomalies are computed from 1987-1997 base period means.

Movements of drifting buoys / Anomalies of sea level



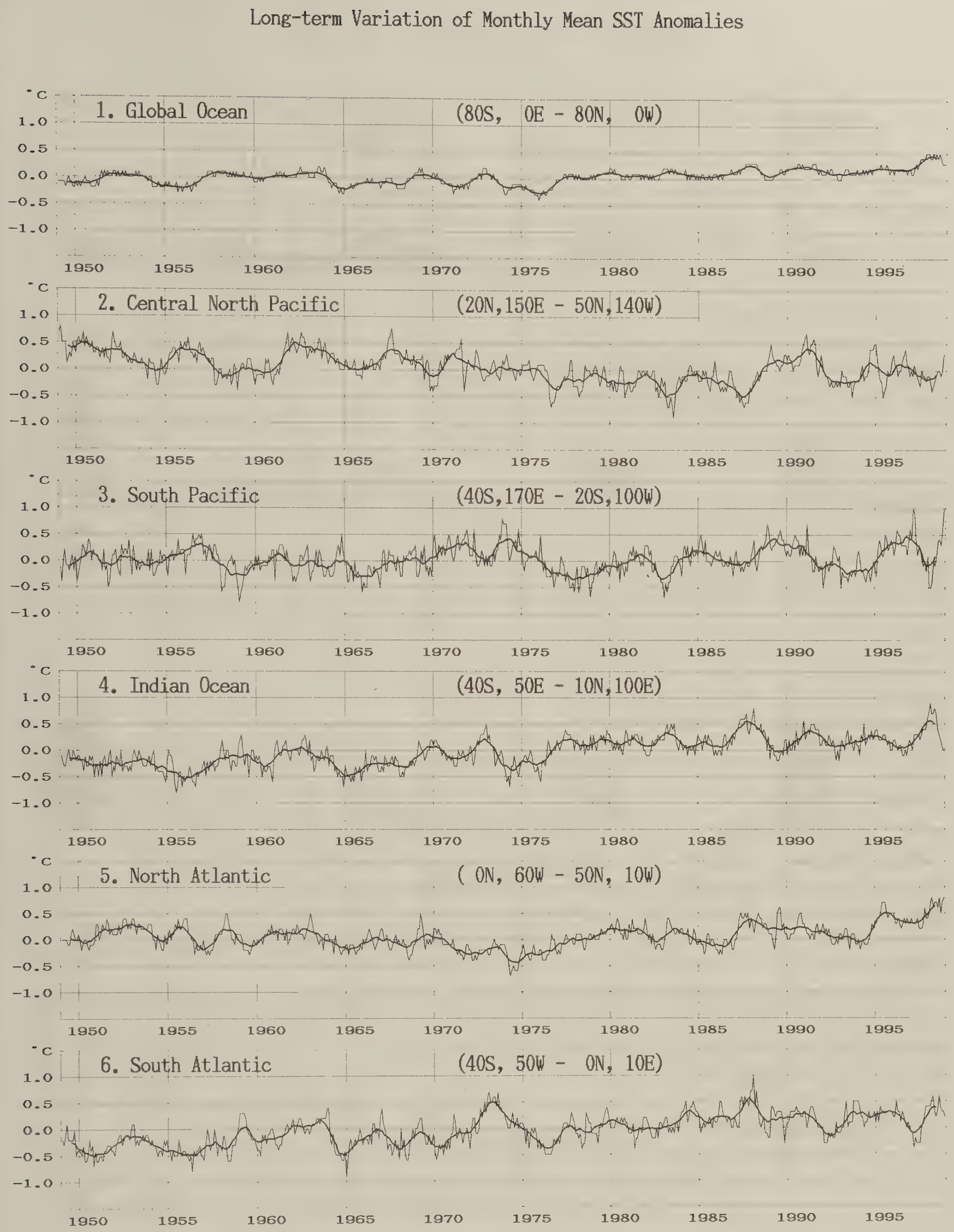
第21図　太平洋ブイ流跡図(1998年11月)

Fig.21 Movements of drifting buoys in the Pacific Ocean during NOV 1998. Each track is for one buoy. Small circles represent last positions for the month.



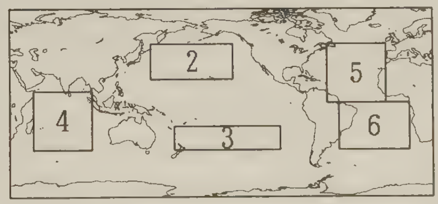
第22図　太平洋海面水位偏差図 (1998年10月)

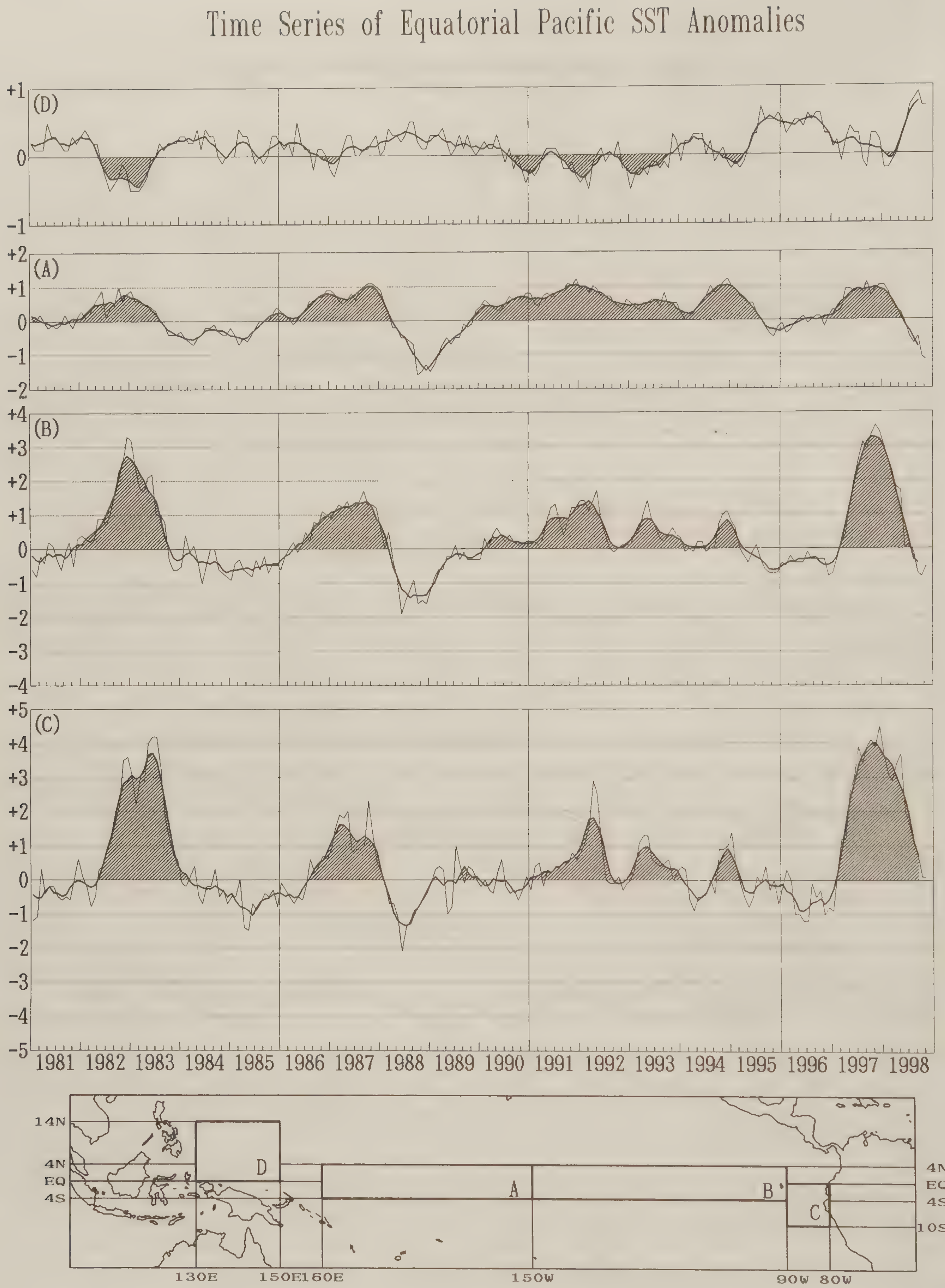
Fig.22 Monthly sea level anomalies for OCT 1998 obtained from mean sea level (1975-1995) adjusted for atmospheric pressure. This figure is prepared by the SOC of ISLP-PAC, Dept. of Oceanography, Univ. of Hawaii.



第23図 海域平均海面水温偏差の長期変動

Fig.23 Long-term variations of monthly mean sea surface temperature anomalies (°C) for the areas shown in the right panel. Anomalies are computed from the JMA climatology (1961-90). Thin lines show the monthly mean and thick lines their 13-month running means.





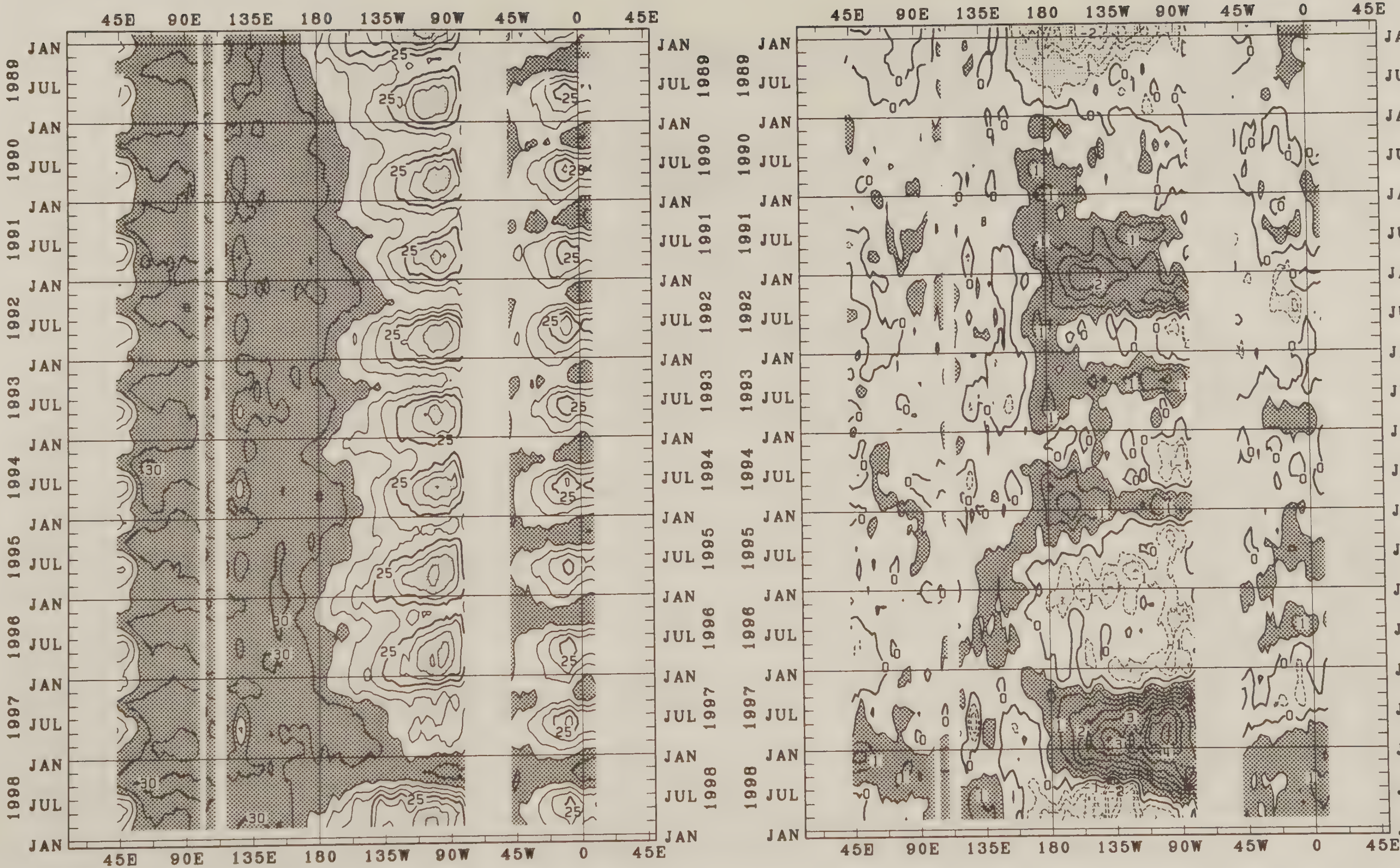
第24図　太平洋赤道域の海面水温偏差時系列図

Fig.24 Time series of monthly mean SST anomalies (°C) in the equatorial Pacific Ocean for the areas indicated at the bottom panel. Thin lines show the monthly means and thick lines their 5-month running means. Positive anomalies (A, B, C) and negative anomalies (D) are shaded. Anomalies are computed from the JMA climatology (1961-1990).

MONTH	SEA SURFACE TEMPERATURE AND ANOMALY (°C) REGION D 14N-EQ 130E-150E		REGION A 4N-4S 160E-150W		REGION B 4N-4S 150W-90W		REGION C EQ-10S 90W-80W		SOI	SEA LEVEL PRESSURE ANOMALY (hPa) TAHITI 17-33S 149-37W	DARWIN 12-24S 130-52E
JAN 96	29.0	0.5	27.9	-0.1	25.0	-0.4	24.1	-0.2	0.8	1.0	-0.7
FEB 96	28.6	0.3	27.6	-0.4	25.7	-0.5	26.0	0.3	0.1	-0.2	-0.5
MAR 96	28.8	0.4	27.8	-0.3	26.7	-0.2	25.9	0.0	0.7	1.0	-0.3
APR 96	29.3	0.5	28.1	-0.1	26.7	-0.4	24.1	-1.0	0.8	0.5	-0.5
MAY 96	29.6	0.5	28.5	0.0	26.2	-0.4	22.9	-1.0	0.3	1.2	1.2
JUN 96	29.7	0.4	28.6	0.1	25.7	-0.4	21.5	-1.2	1.4	1.6	-0.2
JUL 96	29.8	0.6	28.4	-0.1	25.1	-0.1	20.4	-1.2	0.7	0.6	-0.6
AUG 96	29.6	0.5	28.4	0.0	24.3	-0.3	20.5	-0.1	0.4	0.4	-0.3
SEP 96	29.8	0.6	28.4	0.1	24.3	-0.3	19.8	-0.5	0.5	-0.7	-1.7
OCT 96	29.9	0.6	28.5	0.1	24.3	-0.3	20.4	-0.3	0.4	-0.1	-0.8
NOV 96	29.5	0.3	28.2	-0.2	24.3	-0.3	20.5	-1.0	-0.0	-0.5	-0.5
DEC 96	29.2	0.3	28.3	0.1	24.1	-0.8	21.8	-0.8	0.8	-0.3	-1.9
JAN 97	28.6	0.1	28.3	0.3	24.7	-0.7	23.4	-0.9	0.3	1.7	0.9
FEB 97	28.5	0.2	28.2	0.2	25.9	-0.3	25.9	0.2	1.2	1.0	-1.9
MAR 97	28.3	-0.1	28.4	0.3	27.0	0.1	27.1	1.2	-0.6	-0.5	0.9
APR 97	29.0	0.2	29.1	0.9	27.5	0.4	26.3	1.2	-1.1	0.4	2.3
MAY 97	29.5	0.4	29.4	0.9	27.9	1.3	26.5	2.6	-2.5	-2.1	0.9
JUN 97	29.6	0.3	29.3	0.8	28.1	2.0	25.7	3.0	-2.3	-0.8	2.1
JUL 97	29.5	0.3	29.4	0.9	27.8	2.6	25.5	3.9	-0.8	-0.1	1.2
AUG 97	29.0	-0.1	29.2	0.8	27.7	3.1	24.0	3.4	-2.0	-0.9	2.2
SEP 97	29.0	-0.2	29.4	1.1	27.5	2.9	24.2	3.9	-1.4	0.1	2.7
OCT 97	29.6	0.3	29.1	0.7	27.9	3.3	24.8	4.1	-1.6	-0.2	2.7
NOV 97	29.5	0.3	29.3	0.9	28.2	3.6	25.4	3.9	-1.2	0.4	2.7
DEC 97	29.1	0.2	29.2	1.0	28.3	3.4	27.1	4.5	-0.9	-0.5	1.1
JAN 98	28.3	-0.2	29.0	1.0	28.4	3.0	28.0	3.7	-2.3	-3.6	1.4
FEB 98	28.1	-0.2	28.8	0.8	28.8	2.6	28.8	3.1	-1.8	-0.9	3.5
MAR 98	28.3	-0.1	28.6	0.5	29.0	2.1	28.8	2.9	-2.5	-2.8	2.3
APR 98	28.8	0.0	28.5	0.3	28.9	1.8	28.5	3.4	-2.3	-1.5	1.4
MAY 98	29.3	0.2	28.7	0.2	28.3	1.7	27.6	3.7	0.0	0.4	0.5
JUN 98	29.7	0.4	28.4	-0.1	26.1	0.0	24.7	2.0	1.1	0.9	-0.5
JUL 98	29.9	0.7	28.0	-0.5	25.3	0.1	23.2	1.6	1.5	1.8	-0.6
AUG 98	29.9	0.8	27.7	-0.7	24.5	-0.1	21.7	1.1	1.0	1.4	-0.2
SEP 98	30.1	0.9	27.8	-0.5	23.9	-0.7	21.0	0.7	1.0	1.4	-0.4
OCT 98	30.0	0.7	27.3	-1.1	23.8	-0.8	20.8	0.1	1.2	0.8	-1.1
NOV 98	29.9	0.7	27.2	-1.2	24.1	-0.5	21.6	0.1	1.0	0.4	-1.5

第1表　エルニーニョ監視指数

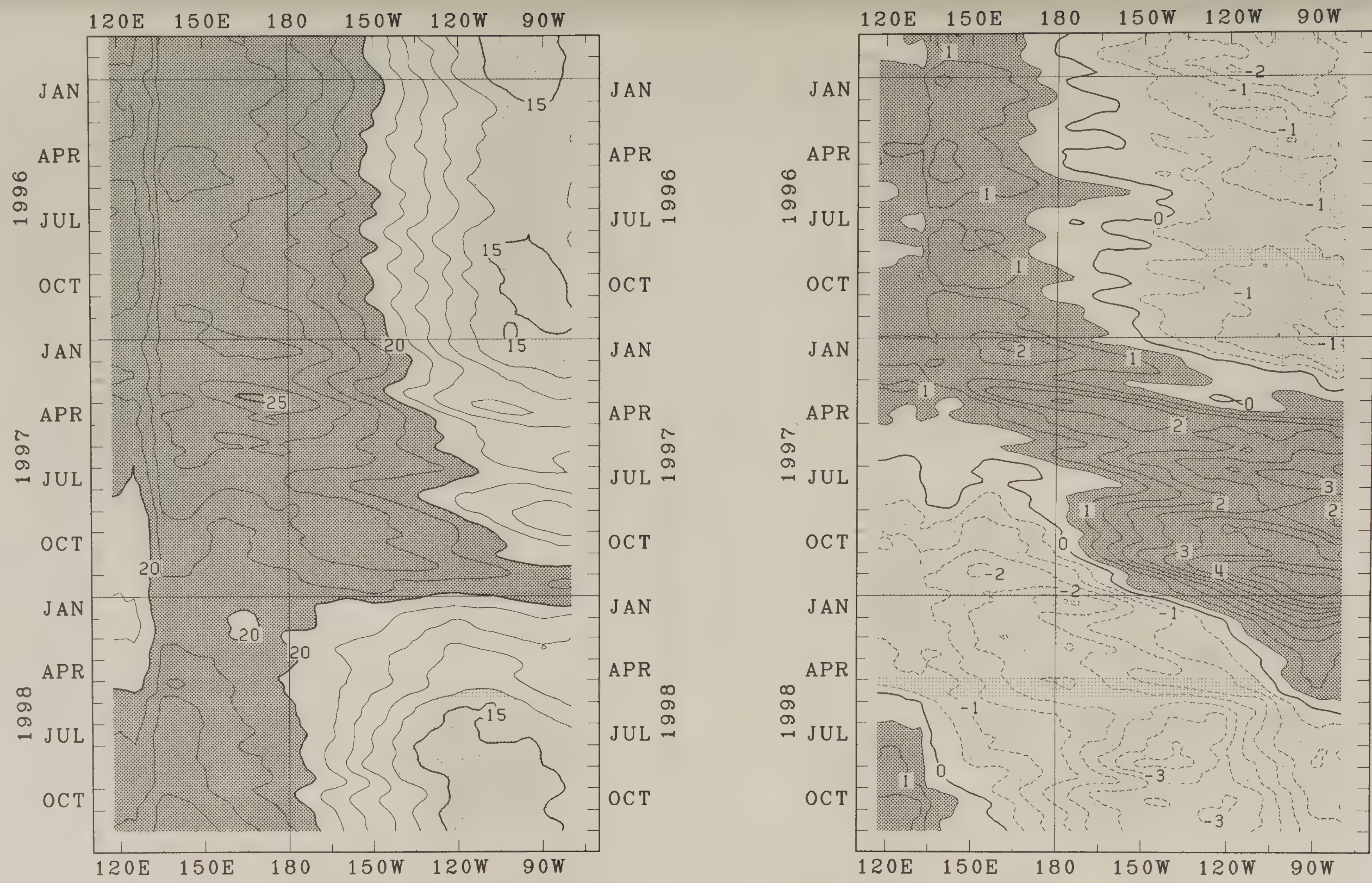
Table 1 El Nino Monitoring indices



第 25 図　赤道に沿った海面水温（左）および偏差（右）の時間-経度断面図

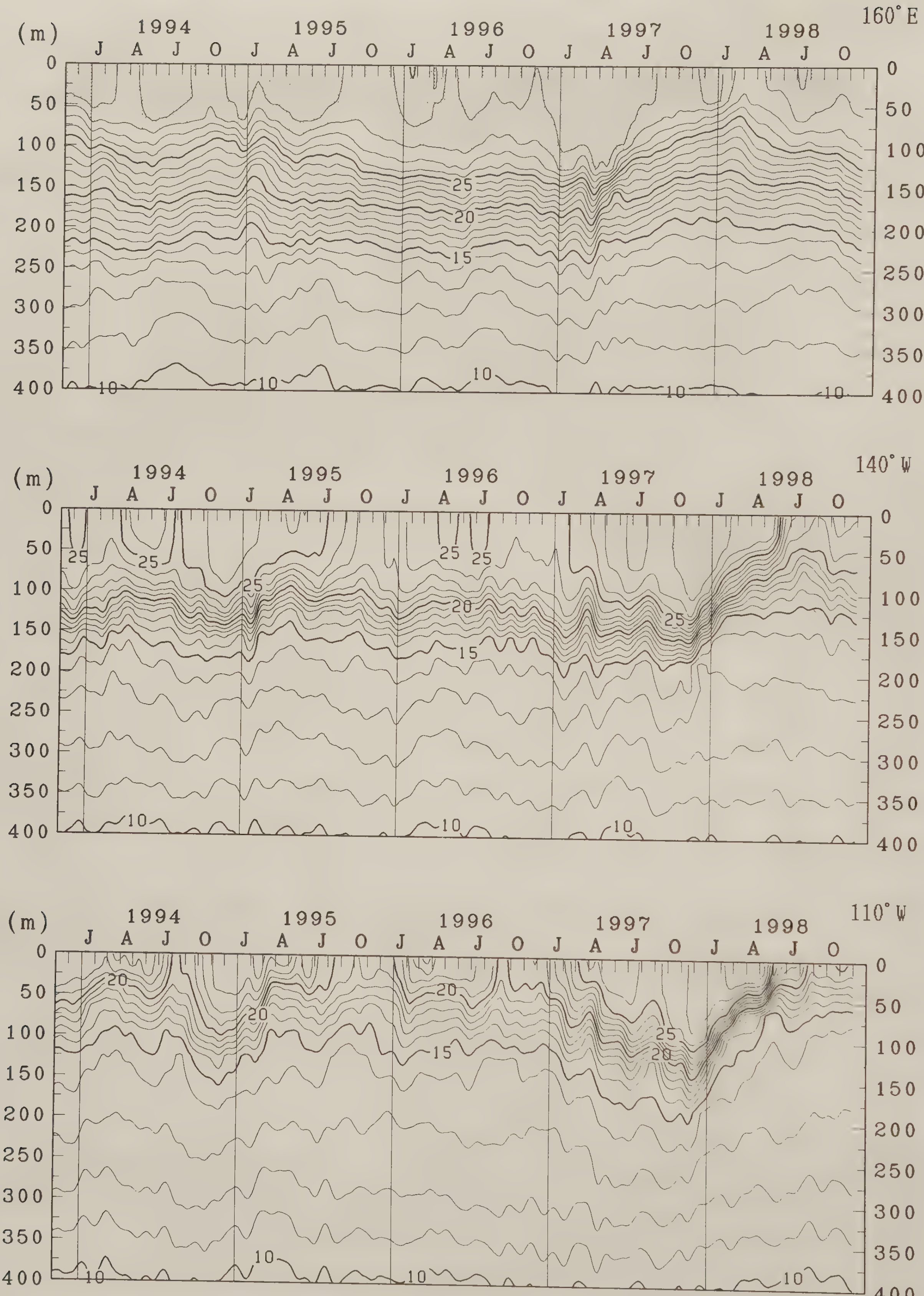
Fig.25 Time-longitude sections of SSTs (left) and anomalies (right) along the equator (2 °N-2 °S) in the global ocean. Contour interval is 1 °C (left) and 0.5 °C (right). Values greater than 28 °C are shaded and values less than 23 °C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1961-1990 base period means.

Time-Longitude Sections of Ocean Heat Content & Anomalies (Eq.)



第26図　太平洋の赤道に沿う海洋表層の貯熱量（左）及び偏差（右）の時間－経度断面図

Fig.26 Time-longitude sections of ocean heat content in the upper 260m along the equator (left) and anomalies (right) in the Pacific Ocean. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (left) and 0.5°C (right). Values greater than 20°C are shaded and values less than 16°C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1987-1997 base period means.



第27図　太平洋赤道域の表層水温の時間－深度断面図

(上：西部、中：中部、下：東部)

Fig.27 Time-depth sections of equatorial subsurface temperature for the western Pacific (top, 160°E), the central Pacific (middle, 140°W) and the eastern Pacific (bottom, 110°W). Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C. Values greater than 28°C are shaded.

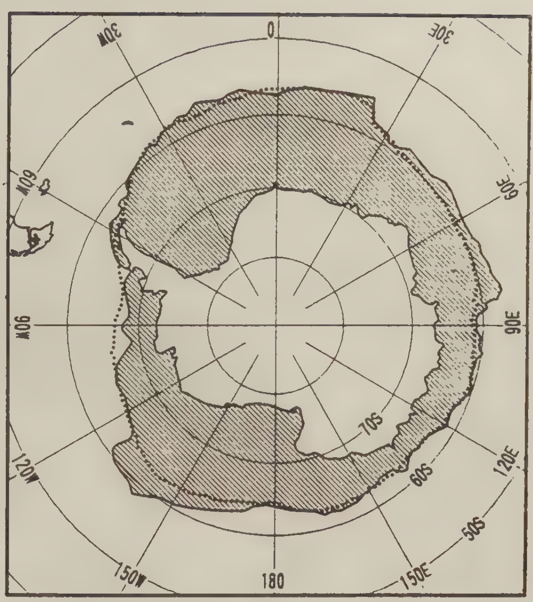


第28-1図 北極域の海氷図（1998年11月12日）

Fig.28-1 Sea ice chart in the Arctic on 12 Nov. 1998.

The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1972 through 1990.

The data source is the National Ice Center (USA).

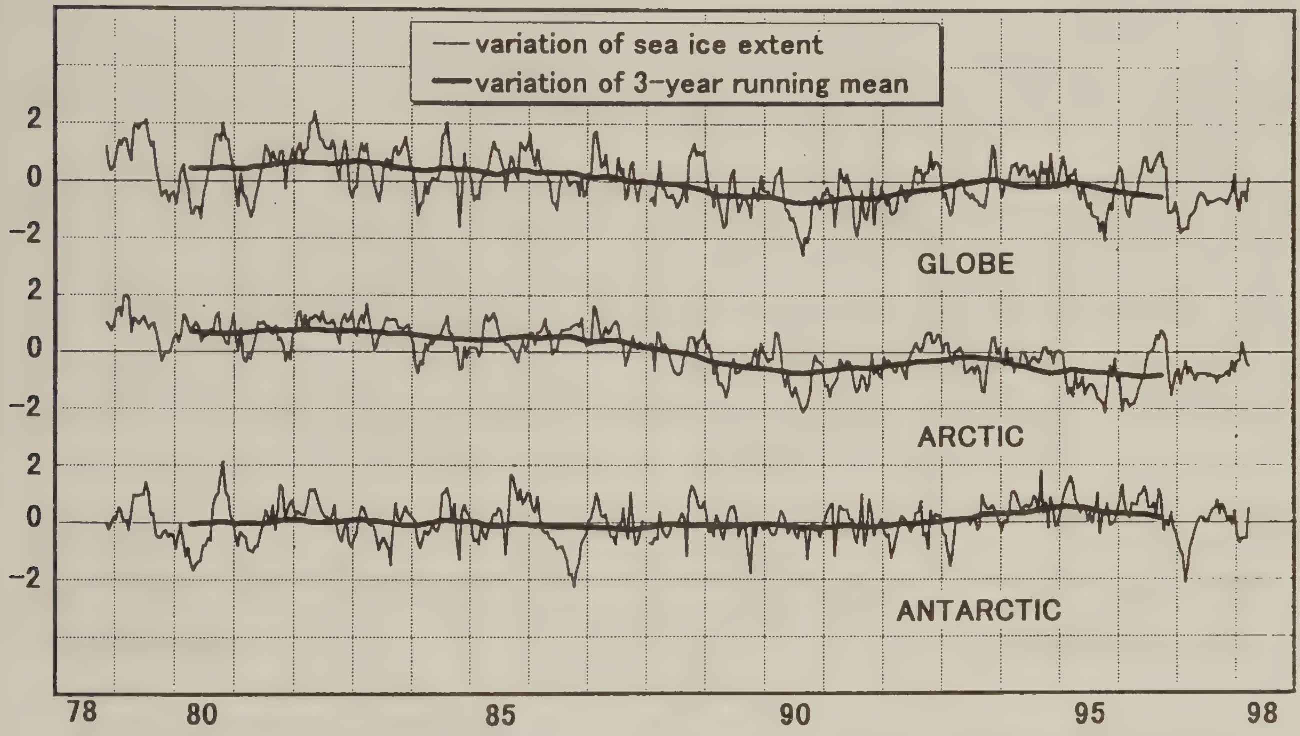


第28-2図 南極域の海氷図（1998年11月12日）

Fig.28-2 Sea ice chart in the Antarctic on 12 Nov. 1998.

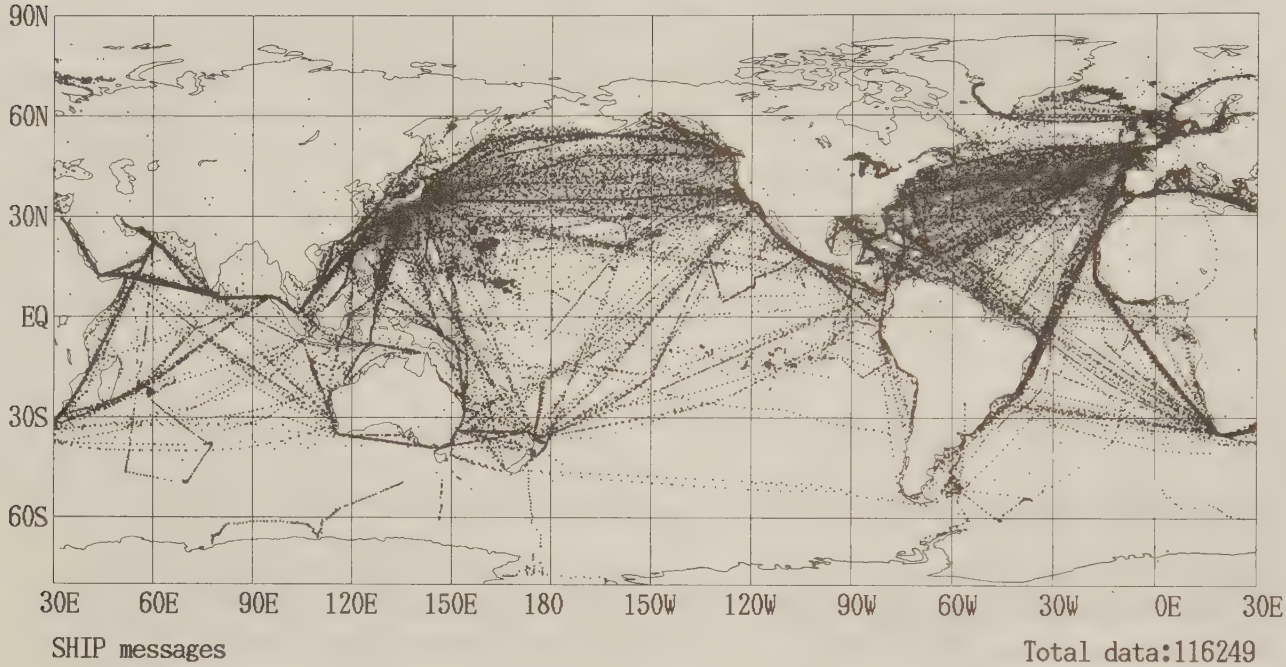
The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1973 through 1990.

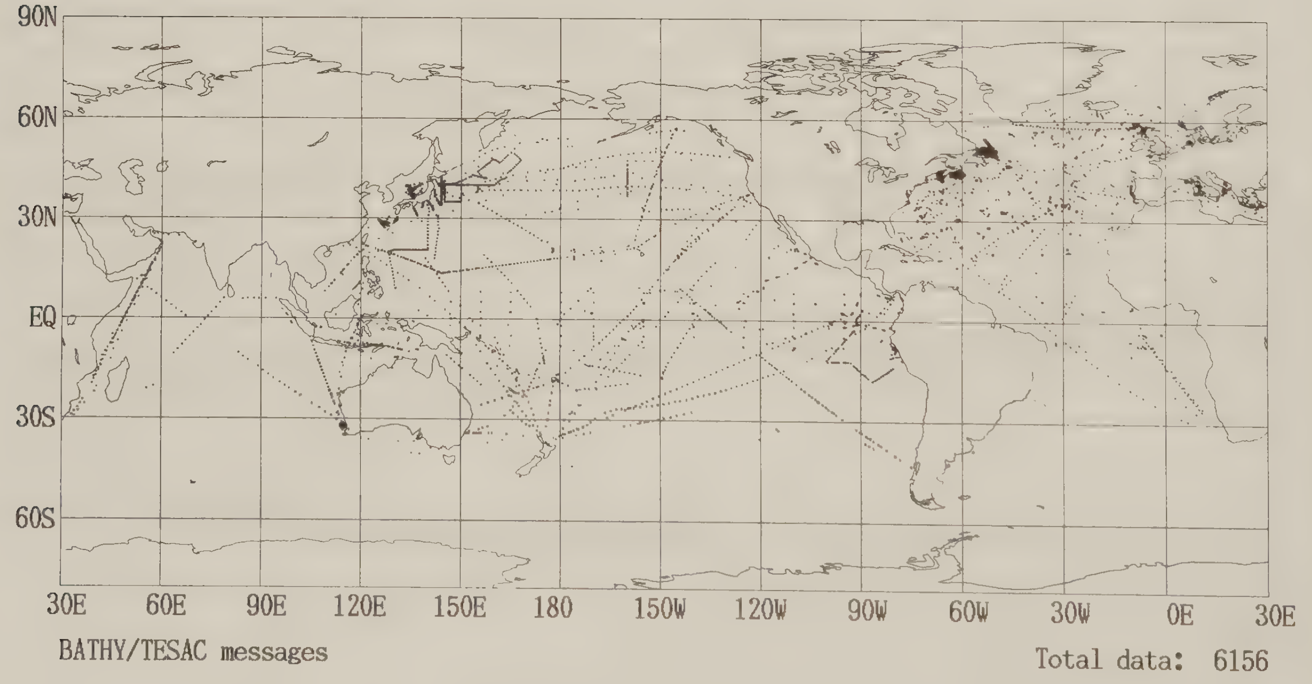
The data source is the National Ice Center (USA).



第28-3図 米国海氷データセンター提供の受動型マイクロ波衛星データから算出した全球及び北極，南極における海氷域面積の平年偏差の時系列図
（縦軸の目盛りは標準偏差（全球71万km²，北極56万km²，南極67万km²）を表す）

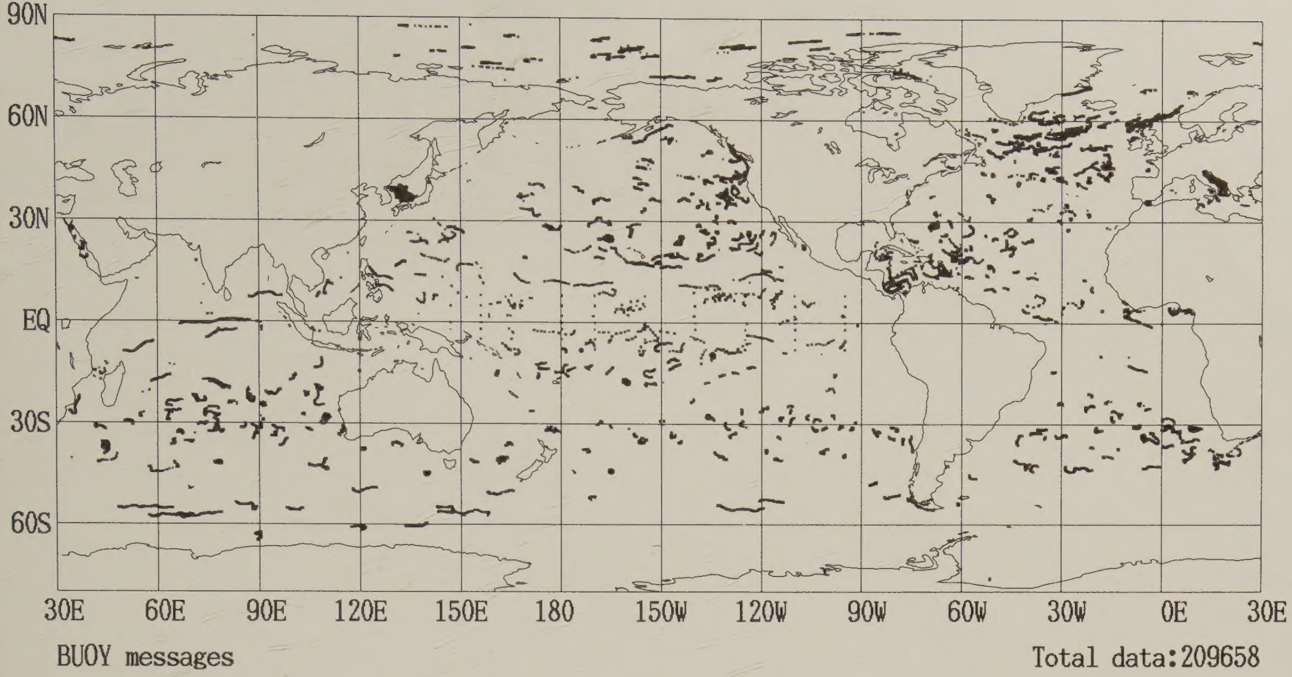
Fig. 28-3 Time-series of the deviation of sea ice extent in the Globe, Arctic and Antarctic derived from satellite passive microwave data supplied by NSIDC
(A scale of the vertical axis indicate standard deviation (Globe: $71\times10^4 km^2$, Arctic: $56\times10^4 km^2$, Antarctic: $67\times10^4 km^2$).)

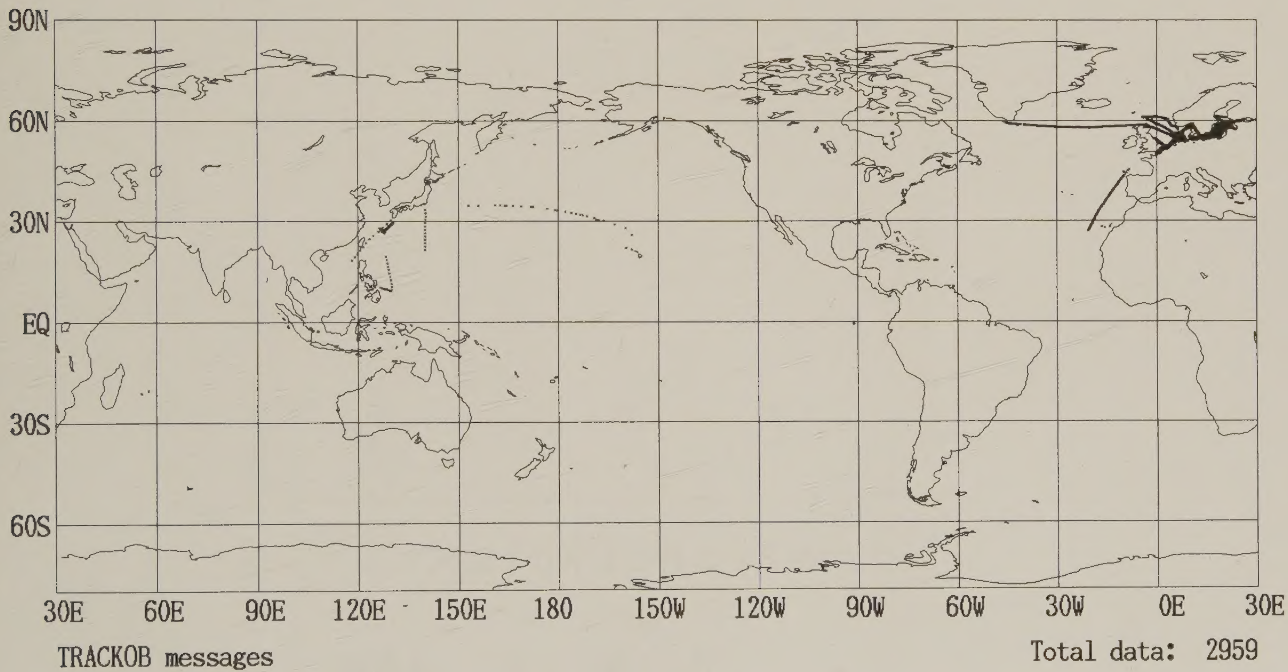




第29-1図　測点分布図(1998年11月)

Fig.29-1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for NOV 1998.





第29-2図　測点分布図(1998年11月)

Fig.29-2 Geographical distribution of BUOY messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for NOV 1998.

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